

# 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: 595
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  
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15\_KI270905v1\_alt : 5161414  
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15\_KQ031389v1\_alt : 2365364  
16\_KV880768v1\_fix : 1927115  
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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  
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19\_GL949748v2\_alt : 1064304

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1\_KI270763v1\_alt : 911658  
6\_KI270801v1\_alt : 870480  
19\_GL949753v2\_alt : 796479  
19\_GL949747v2\_alt : 729520  
14\_KZ208920v1\_fix : 690932  
7\_KZ208913v1\_alt : 680662  
5\_KV575244v1\_fix : 673059  
8\_KI270822v1\_alt : 624492  
7\_KZ208912v1\_fix : 589656  
4\_GL000257v2\_alt : 586476  
12\_KI270904v1\_alt : 572349  
4\_KI270925v1\_alt : 555799  
1\_KV880763v1\_alt : 551020  
12\_KN538369v1\_fix : 541038  
2\_KQ983256v1\_alt : 535088  
2\_KQ031384v1\_fix : 481245  
16\_KZ559113v1\_fix : 480415  
15\_KI270852v1\_alt : 478999  
7\_KV880765v1\_fix : 468267  
1\_KQ031383v1\_fix : 467143  
1\_KN538360v1\_fix : 460100  
3\_KN196475v1\_fix : 451168  
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8\_KI270900v1\_alt : 318687  
12\_KQ759760v1\_fix : 315610  
10\_GL383546v1\_alt : 309802  
13\_KI270838v1\_alt : 306913  
3\_KN196476v1\_fix : 305979  
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1\_KN538361v1\_fix : 305542  
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19\_KI270915v1\_alt : 170665

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 13\_KQ090024v1\_alt : 168146  
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22\_KQ759762v1\_fix : 101037  
19\_KV575257v1\_alt : 100553  
11\_KI270721v1\_random : 100316  
19\_KV575254v1\_alt : 99845  
22\_KI270738v1\_random : 99375  
22\_GL383583v2\_alt : 96924  
2\_GL582966v2\_alt : 96131  
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12\_KN538370v1\_fix : 86533  
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6\_KI270758v1\_alt : 76752  
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22\_KB663609v1\_alt : 74013  
22\_KI270739v1\_random : 73985  
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14\_KI270724v1\_random : 39555  
9\_KI270720v1\_random : 39050  
14\_KI270723v1\_random : 38115  
9\_KI270718v1\_random : 38054  
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Un\_KI270755v1 : 36723  
8\_KI270820v1\_alt : 36640  
13\_KN196483v1\_fix : 35455  
1\_KI270707v1\_random : 32032  
Un\_KI270579v1 : 31033  
Un\_KI270752v1 : 27745  
Un\_KI270512v1 : 22689  
Un\_KI270322v1 : 21476  
M : 16569  
Un\_GL000226v1 : 15008  
10\_KN538365v1\_fix : 14347  
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"           "14_KZ208920v1_fix" "17_KV766198v1_alt"
[28] "7_KZ208912v1_fix" "17_KI270857v1_alt" "20_KI270869v1_alt"
[31] "10_KQ090021v1_fix" "17_KV575245v1_fix" "19_KI270867v1_alt"
[34] "2_KN538363v1_fix" "16_KI270853v1_alt" "15_KI270849v1_alt"
[37] "1_KQ458383v1_alt" "8_KZ208914v1_fix" "11_KQ759759v1_fix"
[40] "2_GL383522v1_alt" "13_KI270842v1_alt" "17_GL383564v2_alt"
[43] "6_GL000251v2_alt" "8_KZ208915v1_fix" "19_KQ458386v1_fix"
```

[46]	"11_KN196481v1_fix"	"11_KI270831v1_alt"	"6_GL000254v2_alt"
[49]	"6_GL000256v2_alt"	"20_KI270870v1_alt"	"19_KI270866v1_alt"
[52]	"8_KI270822v1_alt"	"8_KI270819v1_alt"	"17_GL383563v3_alt"
[55]	"2_KZ208908v1_alt"	"1_GL383519v1_alt"	"19_KN196484v1_fix"
[58]	"4_GL000257v2_alt"	"2_KI270776v1_alt"	"14_KI270846v1_alt"
[61]	"22_KI270875v1_alt"	"19_KI270868v1_alt"	"8_KI270821v1_alt"
[64]	"16_KZ559113v1_fix"	"11_KI270721v1_random"	"9_KN196479v1_fix"
[67]	"7_KI270803v1_alt"	"15_KI270850v1_alt"	"17_JH159146v1_alt"
[70]	"12_KN538369v1_fix"	"8_KI270816v1_alt"	"14_KI270847v1_alt"
[73]	"16_KQ090026v1_alt"	"16_KV880768v1_fix"	"11_KI270832v1_alt"
[76]	"17_KI270861v1_alt"	"12_KN538370v1_fix"	"11_KZ559109v1_fix"
[79]	"3_KN196475v1_fix"	"7_KZ208913v1_alt"	"22_KQ759762v1_fix"
[82]	"11_KZ559110v1_alt"	"1_KZ208904v1_alt"	"5_KI270791v1_alt"
[85]	"8_KI270814v1_alt"	"18_KQ090028v1_fix"	"9_GL383540v1_alt"
[88]	"6_KQ090016v1_fix"	"4_GL383527v1_alt"	"7_KI270808v1_alt"
[91]	"7_KV880765v1_fix"	"5_KV575244v1_fix"	"3_KN538364v1_fix"
[94]	"17_KI270862v1_alt"	"19_GL383574v1_alt"	"22_KI270877v1_alt"
[97]	"12_KZ208916v1_fix"	"17_KI270860v1_alt"	"1_KI270762v1_alt"
[100]	"4_KQ090015v1_alt"	"7_KI270809v1_alt"	"10_KI270825v1_alt"
[103]	"1_GL383518v1_alt"	"11_KI270830v1_alt"	"11_KI270903v1_alt"
[106]	"17_KI270909v1_alt"	"8_KI270813v1_alt"	"21_KI270873v1_alt"
[109]	"5_KI270795v1_alt"	"5_KI270898v1_alt"	"7_KI270806v1_alt"
[112]	"6_GL000255v2_alt"	"3_KZ559103v1_alt"	"12_GL877876v1_alt"
[115]	"12_KI270904v1_alt"	"20_KI270871v1_alt"	"15_KN538374v1_fix"
[118]	"15_KI270905v1_alt"	"17_KI270908v1_alt"	"17_GL000258v2_alt"
[121]	"11_KI270927v1_alt"	"6_KI270801v1_alt"	"5_GL339449v2_alt"
[124]	"10_GL383546v1_alt"	"11_KZ559111v1_alt"	"13_KN538371v1_fix"
[127]	"19_GL949746v1_alt"	"19_GL949752v1_alt"	"19_KI270938v1_alt"
[130]	"19_GL949747v2_alt"	"19_GL949753v2_alt"	"2_KQ983256v1_alt"
[133]	"1_KI270763v1_alt"	"22_KI270734v1_random"	"12_GL877875v1_alt"
[136]	"15_KQ031389v1_alt"	"1_KV880763v1_alt"	"1_KQ458384v1_alt"
[139]	"2_GL582966v2_alt"	"12_KI270833v1_alt"	"6_GL000252v2_alt"
[142]	"1_KN196474v1_fix"	"19_KI270865v1_alt"	"16_KI270855v1_alt"
[145]	"16_KQ090027v1_alt"	"3_KI270782v1_alt"	"8_KI270817v1_alt"
[148]	"2_KI270768v1_alt"	"11_KI270902v1_alt"	"13_KI270838v1_alt"
[151]	"4_KI270896v1_alt"	"4_KQ983257v1_fix"	"4_KQ983258v1_alt"
[154]	"2_KI270769v1_alt"	"15_KI270851v1_alt"	"21_GL383581v2_alt"
[157]	"16_KI270854v1_alt"	"3_KV766192v1_fix"	"6_GL000250v2_alt"
[160]	"19_GL383575v2_alt"	"9_KI270823v1_alt"	"22_KN196485v1_alt"
[163]	"22_KI270928v1_alt"	"22_GL383582v2_alt"	"22_KB663609v1_alt"
[166]	"21_KI270872v1_alt"	"5_KI270897v1_alt"	"22_KI270876v1_alt"
[169]	"1_KN196473v1_fix"	"6_GL000253v2_alt"	"8_KI270900v1_alt"
[172]	"8_KI270926v1_alt"	"8_KI270818v1_alt"	"8_KI270812v1_alt"
[175]	"3_KQ031385v1_fix"	"2_KI270774v1_alt"	"18_KI270863v1_alt"
[178]	"19_GL383573v1_alt"	"7_GL383534v2_alt"	"6_KZ208911v1_fix"
[181]	"10_KN196480v1_fix"	"12_KI270837v1_alt"	"6_KI270758v1_alt"



```

[184] "15_KI270848v1_alt"      "1_GL383520v2_alt"      "22_KQ458387v1_alt"
[187] "22_KN196486v1_alt"      "22_KQ759761v1_alt"      "22_KQ458388v1_alt"
[190] "19_GL949748v2_alt"      "19_GL949749v2_alt"      "19_GL949750v2_alt"
[193] "19_GL949751v2_alt"      "7_KQ031388v1_fix"      "5_KV575243v1_alt"
[196] "19_KV575250v1_alt"      "19_KI270922v1_alt"      "19_KV575258v1_alt"
[199] "19_KI270920v1_alt"      "19_KI270917v1_alt"      "19_KI270923v1_alt"
[202] "19_KI270929v1_alt"      "19_KI270921v1_alt"      "17_KI270910v1_alt"
[205] "3_KI270934v1_alt"      "3_KI270895v1_alt"      "3_KI270779v1_alt"
[208] "3_KI270936v1_alt"      "3_KI270935v1_alt"      "3_KI270924v1_alt"
[211] "3_KI270937v1_alt"      "19_GL000209v2_alt"      "19_KI270882v1_alt"
[214] "19_KI270883v1_alt"      "19_KI270884v1_alt"      "19_KI270885v1_alt"
[217] "19_KI270886v1_alt"      "19_KI270887v1_alt"      "19_KI270888v1_alt"
[220] "19_KI270889v1_alt"      "19_KI270890v1_alt"      "19_KI270891v1_alt"
[223] "19_KI270914v1_alt"      "19_KI270915v1_alt"      "19_KI270916v1_alt"
[226] "19_KI270918v1_alt"      "19_KI270919v1_alt"      "19_KI270930v1_alt"
[229] "19_KI270931v1_alt"      "19_KI270932v1_alt"      "19_KI270933v1_alt"
[232] "19_KV575246v1_alt"      "19_KV575247v1_alt"      "19_KV575248v1_alt"
[235] "19_KV575249v1_alt"      "19_KV575251v1_alt"      "19_KV575252v1_alt"
[238] "19_KV575253v1_alt"      "19_KV575254v1_alt"      "19_KV575255v1_alt"
[241] "19_KV575256v1_alt"      "19_KV575257v1_alt"      "19_KV575259v1_alt"
[244] "19_KV575260v1_alt"

```

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

```

31534_at 31911_at 32864_at 32991_f_at 35885_at 36321_at 40030_at
2935380 13703898 -2786854 -6865917 12701230 12662366 7273971
41214_at 34172_s_at 34215_at 34753_at 37583_at 37583_at 38182_at
2841601 1591603 1591603 57067864 -19703864 -19705414 19567357
38182_at 40097_at 40097_at 40435_at 40436_g_at 41108_at 938_at
19567357 20575710 20575775 -1386151 -1386151 -304749 57184215
31411_at 31411_at 31411_at 34477_at 34477_at 34477_at 1185_at
22984262 24618003 -25030900 -13248378 -13323033 -13297508 1336784
1185_at 35073_at 35073_at 36553_at 36553_at 36554_at 36554_at
1336615 624343 624343 -1403138 -1403138 -1403138 -1403138
39168_at 39168_at 41138_at 41138_at 38355_at 38355_at 38355_at
-2486434 -2486413 2691294 2691294 12905704 12904785 12904857
38355_at 38355_at 32930_f_at 32930_f_at 32930_f_at 32930_f_at 32930_f_at
12903998 12904867 14524528 14622020 14522615 14523745 14524573
32930_f_at 35447_s_at 35447_s_at 35447_s_at 33665_s_at 33665_s_at 33665_s_at
14523504 1595454 1615132 1615058 1268813 1268813 1268813
33665_s_at
1268813

```

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

```
[1] "X"
```

```
> chromInfo(z)
```

1	2	3
248956422	242193529	198295559
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
8_KZ208915v1_fix	15_KI270905v1_alt	15_KN538374v1_fix
6367528	5161414	4998962
6_GL000256v2_alt	6_GL000254v2_alt	6_GL000251v2_alt
4929269	4827813	4795265
6_GL000253v2_alt	6_GL000250v2_alt	6_GL000255v2_alt
4677643	4672374	4606388
6_GL000252v2_alt	17_KI270857v1_alt	16_KI270853v1_alt
4604811	2877074	2659700
15_KQ031389v1_alt	16_KV880768v1_fix	16_KI270728v1_random
2365364	1927115	1872759
17_GL000258v2_alt	5_GL339449v2_alt	14_KI270847v1_alt
1821992	1612928	1511111
17_KI270908v1_alt	14_KI270846v1_alt	5_KI270897v1_alt
1423190	1351393	1144418
7_KI270803v1_alt	19_GL949749v2_alt	19_KI270938v1_alt
1111570	1091841	1066800
19_GL949750v2_alt	19_GL949748v2_alt	12_KZ208916v1_fix
1066390	1064304	1046838
19_GL949751v2_alt	19_GL949746v1_alt	19_GL949752v1_alt
1002683	987716	987100
8_KI270821v1_alt	1_KI270763v1_alt	6_KI270801v1_alt
985506	911658	870480
19_GL949753v2_alt	19_GL949747v2_alt	14_KZ208920v1_fix
796479	729520	690932
7_KZ208913v1_alt	5_KV575244v1_fix	8_KI270822v1_alt
680662	673059	624492
7_KZ208912v1_fix	4_GL000257v2_alt	12_KI270904v1_alt
589656	586476	572349
4_KI270925v1_alt	1_KV880763v1_alt	12_KN538369v1_fix
555799	551020	541038

2_KQ983256v1_alt	2_KQ031384v1_fix	16_KZ559113v1_fix
535088	481245	480415
15_KI270852v1_alt	7_KV880765v1_fix	1_KQ031383v1_fix
478999	468267	467143
1_KN538360v1_fix	3_KN196475v1_fix	15_KI270727v1_random
460100	451168	448248
9_KI270823v1_alt	15_KI270850v1_alt	1_KI270759v1_alt
439082	430880	425601
4_KV766193v1_alt	10_KN538367v1_fix	3_KN538364v1_fix
420675	420164	415308
3_KV766192v1_fix	12_GL877876v1_alt	18_KQ090028v1_fix
411654	408271	407387
19_KQ458386v1_fix	Un_KI270442v1	17_KI270862v1_alt
405389	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
3_KQ031385v1_fix	19_KN196484v1_fix	1_GL383520v2_alt
373699	370917	366580
2_KN538363v1_fix	5_KV575243v1_alt	13_KN538372v1_fix
365499	362221	356766
1_KI270762v1_alt	1_KQ458383v1_alt	9_KN196479v1_fix
354444	349938	330164
1_KZ208906v1_fix	15_KI270848v1_alt	17_KI270909v1_alt
330031	327382	325800
14_KI270844v1_alt	6_KQ031387v1_fix	8_KI270900v1_alt
322166	320750	318687
12_KQ759760v1_fix	10_GL383546v1_alt	13_KI270838v1_alt
315610	309802	306913
3_KN196476v1_fix	8_KI270816v1_alt	1_KN538361v1_fix
305979	305841	305542
11_KZ559108v1_fix	22_KI270879v1_alt	3_KZ559103v1_alt
305244	304135	302885
11_KZ559110v1_alt	8_KI270813v1_alt	11_KI270831v1_alt
301637	300230	296895
15_GL383554v1_alt	19_KV575249v1_alt	8_KI270811v1_alt
296527	293522	292436
18_GL383567v1_alt	X_KI270880v1_alt	8_KI270812v1_alt
289831	284869	282736
19_KI270921v1_alt	17_KV766196v1_fix	17_KI270729v1_random
282224	281919	280839
11_KZ559109v1_fix	1_KQ983255v1_alt	17_JH159146v1_alt
279644	278659	278131
10_KN196480v1_fix	17_KV766198v1_alt	X_KI270913v1_alt
277797	276292	274009

6_KI270798v1_alt	7_KI270808v1_alt	6_KN196478v1_fix
271782	271455	268330
16_KQ090027v1_alt	8_KV880767v1_fix	10_KQ090021v1_fix
267463	265876	264545
22_KI270876v1_alt	15_KI270851v1_alt	22_KI270875v1_alt
263666	263054	259914
1_KI270766v1_alt	19_KI270882v1_alt	3_KI270778v1_alt
256271	248807	248252
17_KV766197v1_alt	6_KQ090016v1_fix	15_KI270849v1_alt
246895	245716	244917
4_KI270786v1_alt	6_KZ208911v1_fix	19_KV575250v1_alt
244096	242796	241058
12_KI270835v1_alt	4_KQ090015v1_alt	17_KI270858v1_alt
238139	236512	235827
19_KI270867v1_alt	16_KI270855v1_alt	18_KZ559115v1_fix
233762	232857	230843
4_KQ983257v1_fix	8_KI270926v1_alt	5_GL949742v1_alt
230434	229282	226852
3_KI270780v1_alt	17_GL383565v1_alt	2_KI270774v1_alt
224108	223995	223625
19_KV575256v1_alt	4_KI270790v1_alt	11_KI270927v1_alt
223118	220246	218612
19_KI270932v1_alt	11_KI270903v1_alt	2_KI270894v1_alt
215732	214625	214158
1_KQ458384v1_alt	12_KN196482v1_fix	14_GL000225v1_random
212205	211377	211173
Un_KI270743v1	11_KI270832v1_alt	7_KI270805v1_alt
210658	210133	209988
Y_KZ208924v1_fix	4_GL000008v2_random	7_KI270809v1_alt
209722	209709	209586
19_KI270887v1_alt	2_KN538362v1_fix	13_KN538371v1_fix
209512	208149	206320
4_KI270789v1_alt	4_KQ983258v1_alt	3_KI270779v1_alt
205944	205407	205312
19_KI270914v1_alt	18_KQ458385v1_alt	19_KI270886v1_alt
205194	205101	204239
11_KI270829v1_alt	11_KN538368v1_alt	14_GL000009v2_random
204059	203552	201709
21_GL383579v2_alt	11_JH159136v1_alt	19_KI270930v1_alt
201197	200998	200773
Un_KI270747v1	18_GL383571v1_alt	19_KI270920v1_alt
198735	198278	198005
3_KZ559102v1_alt	6_KI270797v1_alt	3_KI270935v1_alt
197752	197536	197351
11_KQ759759v1_fix	17_KI270861v1_alt	15_KI270906v1_alt
196940	196688	196384

5_KI270791v1_alt	3_KZ559105v1_alt	14_KI270722v1_random
195710	195063	194050
16_GL383556v1_alt	13_KI270840v1_alt	14_GL000194v1_random
192462	191684	191469
11_JH159137v1_alt	19_KI270917v1_alt	7_KI270899v1_alt
191409	190932	190869
19_KI270923v1_alt	10_KI270825v1_alt	19_GL383576v1_alt
189352	188315	188024
X_KV766199v1_alt	19_KI270922v1_alt	Un_KI270742v1
188004	187935	186739
1_KN196472v1_fix	22_KI270878v1_alt	19_KI270929v1_alt
186494	186262	186203
11_KI270826v1_alt	6_KB021644v2_alt	17_GL000205v2_random
186169	185823	185591
10_KQ090020v1_alt	1_KI270765v1_alt	19_KI270916v1_alt
185507	185285	184516
19_KI270890v1_alt	3_KI270784v1_alt	12_GL383551v1_alt
184499	184404	184319
20_KI270870v1_alt	Un_GL000195v1	1_GL383518v1_alt
183433	182896	182439
11_KQ090022v1_fix	22_KI270736v1_random	2_KZ208907v1_alt
181958	181920	181658
10_KI270824v1_alt	11_KZ559111v1_alt	14_KI270845v1_alt
181496	181167	180703
3_GL383526v1_alt	13_KI270839v1_alt	7_KQ031388v1_fix
180671	180306	179932
22_KI270733v1_random	Un_GL000224v1	10_GL383545v1_alt
179772	179693	179254
Un_GL000219v1	5_KI270792v1_alt	17_KI270860v1_alt
179198	179043	178921
19_KV575252v1_alt	19_GL000209v2_alt	11_KI270830v1_alt
178197	177381	177092
9_KI270719v1_random	Un_GL000216v2	22_KI270928v1_alt
176845	176608	176103
1_KI270712v1_random	3_KZ208909v1_alt	6_KI270800v1_alt
176043	175849	175808
1_KI270706v1_random	12_KZ208918v1_alt	22_KQ458388v1_alt
175055	174808	174749
2_KI270776v1_alt	18_KI270912v1_alt	3_KI270777v1_alt
174166	174061	173649
5_GL383531v1_alt	3_JH636055v2_alt	14_KI270725v1_random
173459	173151	172810
5_KI270796v1_alt	7_KZ559106v1_alt	14_KZ208919v1_alt
172708	172555	171798
9_GL383541v1_alt	19_KV575259v1_alt	19_KI270885v1_alt
171286	171263	171027

19_KI270919v1_alt	19_KI270889v1_alt	19_KI270891v1_alt
170701	170698	170680
19_KI270915v1_alt	19_KI270933v1_alt	19_KI270883v1_alt
170665	170537	170399
19_GL383575v2_alt	19_KV575247v1_alt	19_KI270931v1_alt
170222	170206	170148
12_GL383550v2_alt	16_KQ031390v1_alt	13_KI270841v1_alt
169178	169136	169134
Un_KI270744v1	13_KQ090024v1_alt	19_KV575248v1_alt
168472	168146	168131
18_KI270863v1_alt	18_GL383569v1_alt	12_GL877875v1_alt
167999	167950	167313
21_KI270874v1_alt	19_KV575253v1_alt	3_KI270924v1_alt
166743	166713	166540
1_KN196473v1_fix	1_KZ208904v1_alt	1_KI270761v1_alt
166200	166136	165834
3_KQ031386v1_fix	3_KI270937v1_alt	8_KZ208914v1_fix
165718	165607	165120
22_KI270734v1_random	18_GL383570v1_alt	5_KI270794v1_alt
165050	164789	164558
4_GL383527v1_alt	Un_GL000213v1	3_KI270936v1_alt
164536	164239	164170
3_KZ559101v1_alt	19_KV575246v1_alt	9_KQ090018v1_alt
164041	163926	163882
4_KQ090014v1_alt	3_KI270934v1_alt	18_KZ559116v1_alt
163749	163458	163186
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	19_KV575255v1_alt	18_GL383572v1_alt
161147	161095	159547
19_KV575251v1_alt	8_KI270817v1_alt	4_KI270788v1_alt
159285	158983	158965
Un_KI270749v1	7_KI270806v1_alt	7_KI270804v1_alt
158759	158166	157952
18_KI270911v1_alt	Un_KI270741v1	17_KI270910v1_alt
157710	157432	157099
19_KI270884v1_alt	8_KV880766v1_fix	19_KV575258v1_alt
157053	156998	156965
22_KN196485v1_alt	22_KQ458387v1_alt	19_GL383574v1_alt
156562	155930	155864
19_KI270888v1_alt	3_GL000221v1_random	17_KV575245v1_fix
155532	155397	154723

11_GL383547v1_alt	12_KZ559112v1_alt	2_KI270716v1_random
154407	154139	153799
22_KN196486v1_alt	12_GL383553v2_alt	6_KI270799v1_alt
153027	152874	152148
22_KI270731v1_random	Un_KI270751v1	Un_KI270750v1
150754	150742	148850
13_KN538373v1_fix	19_KV575260v1_alt	8_KI270818v1_alt
148762	145691	145606
22_KQ759761v1_alt	X_KI270881v1_alt	21_KI270873v1_alt
145162	144206	143900
2_GL383521v1_alt	7_KV880764v1_fix	8_KI270814v1_alt
143390	142129	141812
1_KQ458382v1_alt	11_KV766195v1_fix	2_KZ208908v1_alt
141019	140877	140361
1_KZ208905v1_alt	6_KV766194v1_fix	5_KN196477v1_alt
140355	139427	139087
12_GL383552v1_alt	Un_KI270519v1	2_KI270775v1_alt
138655	138126	138019
17_KI270907v1_alt	Un_GL000214v1	8_KI270901v1_alt
137721	137718	136959
2_KI270770v1_alt	5_KZ208910v1_alt	16_KI270854v1_alt
136240	135987	134193
9_KQ090019v1_alt	8_KI270819v1_alt	17_GL383564v2_alt
134099	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	13_KQ090025v1_alt	19_KI270918v1_alt
123821	123480	123111
1_KN196474v1_fix	12_GL383549v1_alt	2_KI270769v1_alt
122022	120804	120616
4_KI270785v1_alt	12_KI270834v1_alt	7_GL383534v2_alt
119912	119498	119183
20_KI270869v1_alt	17_KZ559114v1_alt	21_GL383581v2_alt
118774	116753	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
12_KQ090023v1_alt	3_KI270783v1_alt	11_KN196481v1_fix
109323	109187	108875

17_KI270859v1_alt	11_KI270902v1_alt	3_KZ559104v1_fix
108763	106711	105527
18_GL383568v1_alt	22_KI270737v1_random	13_KI270843v1_alt
104552	103838	103832
8_KZ559107v1_alt	22_KI270877v1_alt	5_GL383530v1_alt
103072	101331	101241
Y_KN196487v1_fix	22_KQ759762v1_fix	19_KV575257v1_alt
101150	101037	100553
11_KI270721v1_random	19_KV575254v1_alt	22_KI270738v1_random
100316	99845	99375
22_GL383583v2_alt	2_GL582966v2_alt	Un_KI270748v1
96924	96131	93321
18_KZ208922v1_fix	Un_KI270435v1	5_GL000208v1_random
93070	92983	92689
Un_KI270538v1	4_KQ090013v1_alt	17_GL383566v1_alt
91309	90922	90219
16_GL383557v1_alt	17_JH159148v1_alt	12_KN538370v1_fix
89672	88070	86533
10_KN538366v1_fix	5_GL383532v1_alt	21_KI270872v1_alt
85284	82728	82692
6_KQ090017v1_alt	Un_KI270756v1	16_KZ208921v1_alt
82315	79590	78609
6_KI270758v1_alt	12_KI270833v1_alt	6_KI270802v1_alt
76752	76061	75005
21_GL383580v2_alt	22_KB663609v1_alt	22_KI270739v1_random
74653	74013	73985
9_GL383540v1_alt	Un_KI270757v1	2_KI270773v1_alt
71551	71251	70887
17_JH159147v1_alt	11_KI270827v1_alt	1_KI270709v1_random
70345	67707	66860
Un_KI270746v1	12_KZ208917v1_fix	16_KI270856v1_alt
66486	64689	63982
21_GL383578v2_alt	Un_KI270753v1	19_KI270868v1_alt
63917	62944	61734
9_GL383542v1_alt	16_KQ090026v1_alt	20_KI270871v1_alt
60032	59016	58661
12_KI270836v1_alt	19_KI270865v1_alt	1_KI270764v1_alt
56134	52969	50258
Y_KZ208923v1_fix	1_KZ559100v1_fix	Un_KI270589v1
48370	44955	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
13_KN196483v1_fix	1_KI270707v1_random	Un_KI270579v1
35455	32032	31033
Un_KI270752v1	Un_KI270512v1	Un_KI270322v1
27745	22689	21476
M	Un_GL000226v1	10_KN538365v1_fix
16569	15008	14347
Un_KI270311v1	Un_KI270366v1	Un_KI270511v1
12399	8320	8127
Un_KI270448v1	Un_KI270521v1	Un_KI270581v1
7992	7642	7046
Un_KI270582v1	Un_KI270515v1	Un_KI270588v1
6504	6361	6158
Un_KI270591v1	Un_KI270522v1	Un_KI270507v1
5796	5674	5353
Un_KI270590v1	Un_KI270584v1	Un_KI270320v1
4685	4513	4416
Un_KI270382v1	Un_KI270468v1	Un_KI270467v1
4215	4055	3920
Un_KI270362v1	Un_KI270517v1	Un_KI270593v1
3530	3253	3041
Un_KI270528v1	Un_KI270587v1	Un_KI270364v1
2983	2969	2855
Un_KI270371v1	Un_KI270333v1	Un_KI270374v1
2805	2699	2656
Un_KI270411v1	Un_KI270414v1	Un_KI270510v1
2646	2489	2415
Un_KI270390v1	Un_KI270375v1	Un_KI270420v1
2387	2378	2321
Un_KI270509v1	Un_KI270315v1	Un_KI270302v1
2318	2276	2274
Un_KI270518v1	Un_KI270530v1	Un_KI270304v1
2186	2168	2165
Un_KI270418v1	Un_KI270424v1	Un_KI270417v1
2145	2140	2043
Un_KI270508v1	Un_KI270303v1	Un_KI270381v1
1951	1942	1930
Un_KI270529v1	Un_KI270425v1	Un_KI270396v1
1899	1884	1880

Un_KI270363v1	Un_KI270386v1	Un_KI270465v1
1803	1788	1774
Un_KI270383v1	Un_KI270384v1	Un_KI270330v1
1750	1658	1652
Un_KI270372v1	Un_KI270548v1	Un_KI270580v1
1650	1599	1553
Un_KI270387v1	Un_KI270391v1	Un_KI270305v1
1537	1484	1472
Un_KI270373v1	Un_KI270422v1	Un_KI270316v1
1451	1445	1444
Un_KI270338v1	Un_KI270340v1	Un_KI270583v1
1428	1428	1400
Un_KI270334v1	Un_KI270429v1	Un_KI270393v1
1368	1361	1308
Un_KI270516v1	Un_KI270389v1	Un_KI270466v1
1300	1298	1233
Un_KI270388v1	Un_KI270544v1	Un_KI270310v1
1216	1202	1201
Un_KI270412v1	Un_KI270395v1	Un_KI270376v1
1179	1143	1136
Un_KI270337v1	Un_KI270335v1	Un_KI270378v1
1121	1048	1048
Un_KI270379v1	Un_KI270329v1	Un_KI270419v1
1045	1040	1029
Un_KI270336v1	Un_KI270312v1	Un_KI270539v1
1026	998	993
Un_KI270385v1	Un_KI270423v1	Un_KI270392v1
990	981	971
Un_KI270394v1		
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] 595
```

### 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.