# Package 'ecolitk'

November 6, 2026

**Version** 1.85.0

**Date** 2010-04

**Title** Meta-data and tools for E. coli

**Author** Laurent Gautier

**Maintainer** Laurent Gautier <lgautier@gmail.com>

**biocViews** Annotation, Visualization

**Depends** R (>= 2.10)

**Imports** Biobase, graphics, methods

**Suggests** ecoliLeucine, ecolicdf, graph, multtest, affy

**Description** Meta-data and tools to work with E. coli. The tools are mostly plotting functions to work with circular genomes. They can used with other genomes/plasmids.

**License** GPL (>= 2)

**git_url** https://git.bioconductor.org/packages/ecolitk

**git_branch** devel

**git_last_commit** 6b31c2f

**git_last_commit_date** 2026-04-28

**Repository** Bioconductor 3.24

**Date/Publication** 2026-11-05

## Contents


ecoli.m52.genome . . . 2
ecoligenome.operon . . . 3
ecoligenomeBNUM . . . 4
ecoligenomeBNUM2MULTIFUN . . . 4
gccontent . . . 5
linkedmultiget . . . 5
multiFun . . . 6
pointsCircle . . . 7
polar2xy . . . 8
polygonChrom . . . 9
wstringapply . . . 11

**Index** **13**

ecoli.m52.genome *Escherichia coli data*

## Description

Meta-data related to Escherichia coli

## Usage

```
data(ecoli.m52.genome)
data(ecoligenomeCHRLOC)
data(ecoligenomeSYMBOL2AFFY)
data(ecoligenomeSYMBOL)
data(ecoligenomeSTRAND)
data(ecoligenome.operon)
ecoli.len
```

## Format

The format for ecoli.m52.genome is character with genome sequence. The format for ecoligenomeCHRLOC is an environment (as a hash table). Each key is an Affyemtrix probe set ID, and each value is vector of two integers (begining and end - see the details below) The format for ecoligenomeSYMBOL2AFFFY is an environment (as a hash table). Each key is a gene symbol name. The format for ecoligenomeSYMBOL is an environment (as a hash table). Each key is an Affymetrix probe set id ecoli.len is a variable containing the size of the genome in ecoli.m52.genome.

## Details

The environments ecoligenomeSYMBOL2AFFFY and ecoligenomeSYMBOL are like the ones in the data packages built by annBuilder.

The environment ecoligenomeCHRLOC differs: two integers are associated with each key, one corresponds to the begining of the segment the other to the end.

The environment ecoligenomeSTRAND returns a logical. TRUE means that the orientation is '+', FALSE means that the orientation is '-' (and NA is used when irrelevant for the key).

## Source

http://www.genome.wisc.edu/sequencing/k12.htm and http://www.biostat.harvard.edu/complab/dchip/info_file.htm

## Examples

```
data(ecoli.m52.genome)
```

`ecoligenome.operon` *Known operon in E.coli - data.frame*

## Description

The known operon in the Escherichia coli genome.

## Usage

```
data(ecoligenome.operon)
```

## Format

A data frame with 932 observations (genes) on the following 4 variables.

**gene.name** a character vector

**gene.annotation** a character vector

**operon.name** a factor with levels the names of the operons

**operon.comments** a factor with levels the comments for the operons

## Details

For some operons, the source of information specifies the existence of regulating elements such as promoter, terminator, box, etc... In those cases, the `gene.name` is set to `"Regulation"`, and the `gene.annotation` gives what kind of regulating element it is. If volonteers, it would be neat to map those on the genome... Besides that, not much to add. The data structure is fairly straightforward.

## Source

Built from the webpage: http://www.cib.nig.ac.jp/dda/backup/taitoh/ecoli.operon.html

## Examples

```
library(Biobase)
data(ecoligenome.operon)
data(ecoligenomeSYMBOL2AFFY)

## something that might be useful when working with Affymetrix data:
## get the Affymetrix identifiers for the probe sets bundled in operons
## (see the vignette for more details)
ecoligenome.operon$affyid <-
unname(unlist(mget(ecoligenome.operon$gene.name,
                   ecoligenomeSYMBOL2AFFY, ifnotfound=NA)))
```

## ecoligenomeBNUM *Environment for 'bnum' identifiers*

### Description

Environments to associate Affymetrix probe set IDs with 'bnum' IDs

### Usage

```
data(ecoligenomeBNUM)
data(ecoligenomeBNUM2SYMBOL)
data(ecoligenomeBNUM2ENZYME)
data(ecoligenomeBNUM2GENBANK)
data(ecoligenomeBNUM2GENEPRODUCT)
data(ecoligenomeSYMBOL2BNUM)
```

### Format

These are `environment` objects.

### Details

Escherichia coli genes are sometimes identified by 'bnum's. This identfier is typically a 'b' followed by digits.

### Source

BNUM numbers were parsed out of the Affymetrix identifiers. BNUM2* were obtained from the GenProtEC website.

## ecoligenomeBNUM2MULTIFUN *Environment*

### Description

An environment to store associtations between 'bnum' identifiers (key) and 'MultiFun' identifiers (or strand information).

### Usage

```
data(ecoligenomeBNUM2MULTIFUN)
```

### Format

The format is: length 0 <environment> - attr(*, "comments")= chr "GenProtEC: MultiFun assignments for E. coli modules September 17th, 2003"

### Details

'MultiFun' is a classification scheme. The structure is 'approximately tree-like'. Several 'MultiFun' numbers can be assigned to one 'bnum'.

### Source

"http://genprotec.mbl.edu/files/MultiFun.txt"

---

## gccontent *function to compute gccontent*

---

### Description

A simple R function to compute the GC content of a sequence

### Usage

```
gccontent(x)
```

### Arguments

| | |
|---|---|
| x | a vector of mode character |

### Details

This a simple (and not particularly fast) function to compute the GC content of sequence. When speed is an issue, one should use the function in the package matchprobes. This function only exists to avoid dependency on this package.

### Value

The GC content (numeric)

---

## linkedmultiget *A function to look for values across linked environments*

---

### Description

A function to look for values across linked environments.

### Usage

```
linkedmultiget(x, envir.list = list(), unique = TRUE)
```

### Arguments

| | |
|---|---|
| x | The keys in the first environment in the list. |
| envir.list | A list of environments. |
| unique | Simplify the list returned by ensuring that the values for each key are unique. |

## Details

Environments can be considered as hashtables. The keys are obviously strings, but in some cases the associated values are also strings. This is the case for annotation environments (as built with the package AnnBuilder). This function helps to look for values across several environments: the keys have associated values in a first environment, these values are used as keys in the second environments, etc...

## Value

A list of length the length of x.

## Author(s)

Laurent Gautier

## See Also

mget

## Examples

```
data(ecoligenomeBNUM)
data(ecoligenomeBNUM2MULTIFUN)
data(multiFun)

## get 5 Affymetrix IDs
set.seed(456)
my.affyids <- sample(ls(ecoligenomeBNUM), 5)

## get the MULTIFUN annotations for them
r <- linkedmultiget(my.affyids, list(ecoligenomeBNUM,
                    ecoligenomeBNUM2MULTIFUN, multiFun))

print(r)
```

---

# multiFun *multiFun classification*

---

## Description

The MultiFun classification scheme

## Usage

```
data(multiFun)
data(ecoligenomeMULTIFUN2GO)
```

## Format

These are environments.

## Source

http://genprotec.mbl.edu/files/MultiFun.txt

## Examples

```
## To be done...
```

---

pointsCircle *Functions to plot circular related figures*

---

## Description

Functions to plot circular related figures

## Usage

```
linesCircle(radius, center.x = 0, center.y = 0, edges = 300, ...)
polygonDisk(radius, center.x = 0, center.y = 0, edges=300,
...)
arrowsArc(theta0, theta1, radius, center.x = 0, center.y = 0, edges = 10,
          length = 0.25, angle = 30, code = 2, ...)
pointsArc(theta0, theta1, radius, center.x = 0, center.y = 0, ...)
linesArc(theta0, theta1, radius, center.x = 0, center.y = 0, ...)
polygonArc(theta0, theta1, radius.in, radius.out,
           center.x = 0, center.y = 0,
           edges = 10,
           col = "black",
           border = NA,
           ...)
```

## Arguments

| | |
|---|---|
| theta0, theta1 | start and end angles for the arc |
| radius | radius of the circle |
| radius.in | inner radius |
| radius.out | outer radius |
| center.x, center.y | Coordinates for the center of the circle (default to (0, 0)) |
| edges | number of edges the shape is made of |
| col | color |
| border | border (see polygon) |
| length, angle, code | see the corresponding parameters for the function arrows |
| ... | optional graphical paramaters |

## Details

Details to come... for now the best to run the examples and experiment by yourself...

## Value

Function only used for their border effects.

## Author(s)

laurent

## Examples

```
par(mfrow=c(2,2))
n <- 10
thetas <- rev(seq(0, 2 * pi, length=n))

rhos <- rev(seq(1, n) / n)

xy <- polar2xy(rhos, thetas)
colo <- heat.colors(n)

plot(0, 0, xlim=c(-2, 2), ylim=c(-2, 2), type="n")
for (i in 1:n)
  linesCircle(rhos[i]/2, xy$x[i], xy$y[i])

plot(0, 0, xlim=c(-2, 2), ylim=c(-2, 2), type="n")
for (i in 1:n)
  polygonDisk(rhos[i]/2, xy$x[i], xy$y[i], col=colo[i])

plot(0, 0, xlim=c(-2, 2), ylim=c(-2, 2), type="n", xlab="", ylab="")
for (i in 1:n)
  polygonArc(0, thetas[i],
             rhos[i]/2, rhos[i],
             center.x = xy$x[i], center.y = xy$y[i], col=colo[i])

plot(0, 0, xlim=c(-2, 2), ylim=c(-2, 2), type="n", xlab="", ylab="")
for (i in (1:n)[-1]) {
  linesCircle(rhos[i-1], col="gray", lty=2)
  polygonArc(thetas[i-1], thetas[i],
             rhos[i-1], rhos[i], col=colo[i],
             edges=20)
  arrowsArc(thetas[i-1], thetas[i],
             rhos[i] + 1, col=colo[i],
             edges=20)
}
```

---

`polar2xy` *Functions to perform polar coordinate related functions*

---

## Description

Functions to perform polar coordinate related functions

### Usage

```
polar2xy(rho, theta)
xy2polar(x, y)
rotate(x, y, alpha)
```

### Arguments

| | |
|---|---|
| x | cartesian coordinate |
| y | cartesian coordinate |
| rho | polar radius rho |
| theta | polar angle theta |
| alpha | angle to perform rotation |

### Details

y and theta can be respectively missing. In this case, x and rho are expected to be lists with entries x, y, rho, theta respectively.

### Examples

```
n <- 40
nn <- 2
thetas <- seq(0, nn * 2 * pi, length=n)

rhos <- seq(1, n) / n

plot(c(-1, 1), c(-1, 1), type="n")
abline(h=0, col="grey")
abline(v=0, col="grey")

xy <- polar2xy(rhos, thetas)

points(xy$x, xy$y, col=rainbow(n))
```

---

## polygonChrom *Functions to plot circular chromosomes informations*

---

### Description

Functions to plot circular chromosomes informations

### Usage

```
cPlotCircle(radius=1, xlim=c(-2, 2), ylim=xlim, edges=300, main=NULL,
            main.inside, ...)

chromPos2angle(pos, len.chrom, rot=pi/2, clockwise=TRUE)

polygonChrom(begin, end, len.chrom, radius.in, radius.out,
```

```
              total.edges = 300,
              edges = max(round(abs(end - begin)/len.chrom *
                      total.edges), 2, na.rm = TRUE),
              rot = pi/2, clockwise = TRUE, ...)

linesChrom(begin, end, len.chrom, radius,
              total.edges = 300,
              edges = max(round(abs(end - begin)/len.chrom *
                      total.edges), 2, na.rm = TRUE),
              rot = pi/2, clockwise = TRUE, ...)

ecoli.len
```

## Arguments

| | |
|---|---|
| radius | radius |
| xlim, ylim | range for the plot. Can be used to zoom-in a particular region. |
| pos | position (nucleic base coordinate) |
| begin | begining of the segment (nucleic base number). |
| end | end of the segment (nucleic base number). |
| len.chrom | length of the chromosome in base pairs |
| radius.in | inner radius |
| radius.out | outer radius |
| total.edges | total number of edges for the chromosome |
| edges | number of edges for the specific segment(s) |
| rot | rotation (default is pi / 2, bringing the angle zero at 12 o'clock) |
| clockwise | rotate clockwise. Default to TRUE. |
| main, main.inside | main titles for the plot |
| ... | optional graphical parameters |

## Details

The function chromPos2angle is a convenience function. The variable ecoli.len contains the size of the Escheria coli genome considered (K12).

## Value

Except chromPos2angle, the function are solely used for their border effects.

## Author(s)

laurent <laurent@cbs.dtu.dk>

## Examples

```
data(ecoligenomeSYMBOL2AFFY)
data(ecoligenomeCHRLOC)

## find the operon lactose ("lac*" genes)
lac.i <- grep("^lac", ls(ecoligenomeSYMBOL2AFFY))
lac.symbol <- ls(ecoligenomeSYMBOL2AFFY)[lac.i]
lac.affy <- unlist(lapply(lac.symbol, get, envir=ecoligenomeSYMBOL2AFFY))

beg.end <- lapply(lac.affy, get, envir=ecoligenomeCHRLOC)
beg.end <- matrix(unlist(beg.end), nc=2, byrow=TRUE)

lac.o <- order(beg.end[, 1])

lac.i <- lac.i[lac.o]
lac.symbol <- lac.symbol[lac.o]
lac.affy <- lac.affy[lac.o]
beg.end <- beg.end[lac.o, ]

lac.col <- rainbow(length(lac.affy))

par(mfrow=c(2,2))

## plot

cPlotCircle(main="lac genes")
polygonChrom(beg.end[, 1], beg.end[, 2], ecoli.len, 1, 1.2, col=lac.col)
rect(0, 0, 1.1, 1.1, border="red")

cPlotCircle(xlim=c(0, 1.2), ylim=c(0, 1.1))
polygonChrom(beg.end[, 1], beg.end[, 2], ecoli.len, 1, 1.1, col=lac.col)
rect(0.4, 0.8, 0.7, 1.1, border="red")

cPlotCircle(xlim=c(.45, .5), ylim=c(.85, 1.0))
polygonChrom(beg.end[, 1], beg.end[, 2], ecoli.len, 1, 1.03, col=lac.col)

mid.genes <- apply(beg.end, 1, mean)
mid.angles <- chromPos2angle(mid.genes, ecoli.len)
xy <- polar2xy(1.03, mid.angles)
xy.labels <- data.frame(x = seq(0.45, 0.5, length=4), y = seq(0.95, 1.0, length=4))
segments(xy$x, xy$y, xy.labels$x, xy.labels$y, col=lac.col)
text(xy.labels$x, xy.labels$y, lac.symbol, col=lac.col)
```

---

`wstringapply` *Apply a function on a window sliding on a string*

---

## Description

Apply a function on a window sliding on a string.

## Usage

```
wstringapply(x, SIZE, SLIDE, FUN, ...)
```

## Arguments

| | |
|---|---|
| x | The string |
| SIZE | The size of the window (number of characters). |
| SLIDE | offset to move at each slide |
| FUN | The function to be applied |
| ... | optional parameter for the function FUN |

## Details

Apply the function FUN to substrings of x of length SIZE.

## Value

A list of size nchar(x) - SIZE.

## Author(s)

L, Gautier

# Index


∗ **aplot**
    pointsCircle, 7
∗ **datasets**
    ecoli.m52.genome, 2
    ecoligenome.operon, 3
    ecoligenomeBNUM, 4
    ecoligenomeBNUM2MULTIFUN, 4
    multiFun, 6
∗ **dplot**
    polygonChrom, 9
∗ **hplot**
    polygonChrom, 9
∗ **manip**
    gccontent, 5
    linkedmultiget, 5
    polar2xy, 8
    wstringapply, 11

arrows, *7*
arrowsArc *(*pointsCircle*)*, 7

chromPos2angle *(*polygonChrom*)*, 9
cPlotCircle *(*polygonChrom*)*, 9

ecoli.len *(*ecoli.m52.genome*)*, 2
ecoli.m52.genome, 2
ecoli.operon *(*ecoli.m52.genome*)*, 2
ecoligenome.operon, 3
ecoligenomeBNUM, 4
ecoligenomeBNUM2ENZYME
        *(*ecoligenomeBNUM*)*, 4
ecoligenomeBNUM2GENBANK
        *(*ecoligenomeBNUM*)*, 4
ecoligenomeBNUM2GENEPRODUCT
        *(*ecoligenomeBNUM*)*, 4
ecoligenomeBNUM2MULTIFUN, 4
ecoligenomeBNUM2STRAND
        *(*ecoligenomeBNUM2MULTIFUN*)*, 4
ecoligenomeBNUM2SYMBOL
        *(*ecoligenomeBNUM*)*, 4
ecoligenomeCHRLOC *(*ecoli.m52.genome*)*, 2
ecoligenomeMULTIFUN2GO *(*multiFun*)*, 6
ecoligenomeSTRAND *(*ecoli.m52.genome*)*, 2
ecoligenomeSYMBOL *(*ecoli.m52.genome*)*, 2
ecoligenomeSYMBOL2AFFY
        *(*ecoli.m52.genome*)*, 2
ecoligenomeSYMBOL2BNUM
        *(*ecoligenomeBNUM*)*, 4

gccontent, 5

linesArc *(*pointsCircle*)*, 7
linesChrom *(*polygonChrom*)*, 9
linesCircle *(*pointsCircle*)*, 7
linkedmultiget, 5

mget, *6*
multiFun, 6

pointsArc *(*pointsCircle*)*, 7
pointsCircle, 7
polar2xy, 8
polygon, *7*
polygonArc *(*pointsCircle*)*, 7
polygonChrom, 9
polygonDisk *(*pointsCircle*)*, 7

rotate *(*polar2xy*)*, 8

wstringapply, 11

xy2polar *(*polar2xy*)*, 8