

# The Pviz User Guide

Renan Sauteraud\*

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## Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Gviz tracks</b>	<b>1</b>
2.1	ATrack . . . . .	1
2.2	DTrack . . . . .	2
<b>3</b>	<b>Pviz new track types</b>	<b>3</b>
3.1	ProteinAxisTrack . . . . .	3
3.2	ProteinSequenceTrack . . . . .	3
3.3	ProbeTrack . . . . .	4
<b>4</b>	<b>Example of plot</b>	<b>7</b>
<b>5</b>	<b>sessionInfo</b>	<b>8</b>

## 1 Introduction

Pviz is an R package inspired by and depending on Gviz. It introduces new types of track and extends the existing ones in order to deal with amino-acid based data.

This package keeps most of the mechanics of Gviz, notably the use of DisplayParameters and the same plotting function: plotTracks. Therefore, the user is invited to refer to Gviz help pages and vignette for more information and examples.

As with any R package, it should first be loaded in the session

```
library(Pviz)
```

## 2 Gviz tracks

Pviz extends and uses the most common classes of Gviz to make them easier to use with amino acid data. We removed the requirement for a genome and a chromosome when creating these tracks. Moreover, they support the functions defined in Pviz.

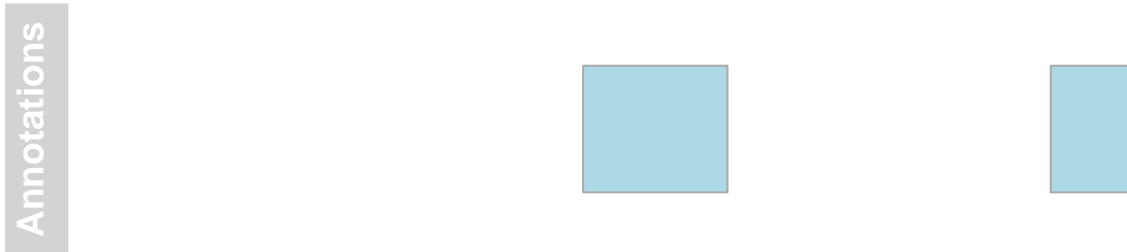
---

\*rsautera@fhcrc.org

## 2.1 ATrack

ATrack extends Gviz's `AnnotationTrack` and behaves the same way. However, it does not require to specify a chromosome and a genome. Please refer to `Gviz` documentation for more details about `AnnotationTrack` and the available `DisplayParameters`.

```
at <- ATrack(start = c(250, 480), end = c(320, 520), name = "Annotations")
plotTracks(at, from = 1, to = 600)
```

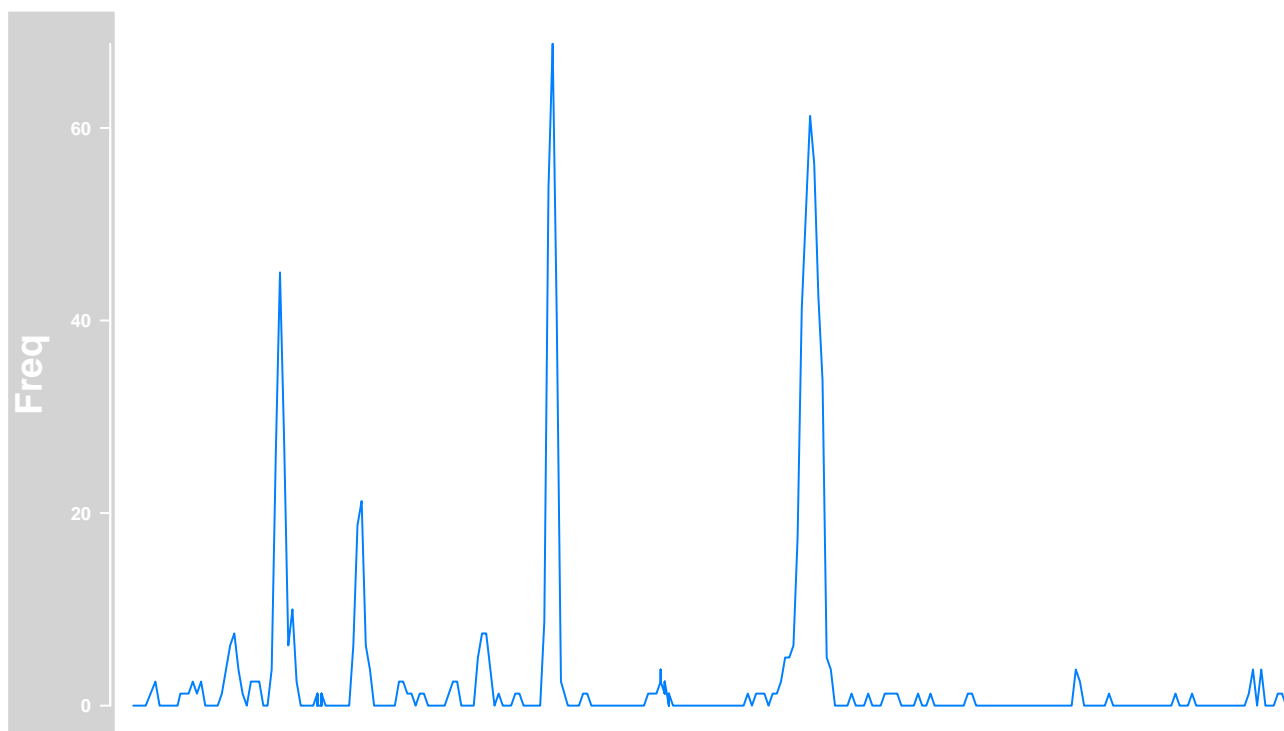


## 2.2 DTrack

Naturally `DTrack` extends Gviz's `DataTrack`. Here again, please refer to `Gviz` documentation for details on how to use `DataTrack`.

Some example data are available in the data package `PEP.db`. Expression frequency for peptide in `hxb2` envelope.

```
library(PEP.db)
data(PvizVignette)
dt <- DTrack(data = freqEx, start = startEx, width = 15, name = "Freq")
plotTracks(dt, from = 1, to = 850, type = "l")
```



### 3 Pviz new track types

Pviz introduces some new track types to deal with amino-acid based data. The new tracks look can be modified using the `DisplayParameters` and will most of the time offer the same options as the ones available for `Gviz` tracks.

#### 3.1 ProteinAxisTrack

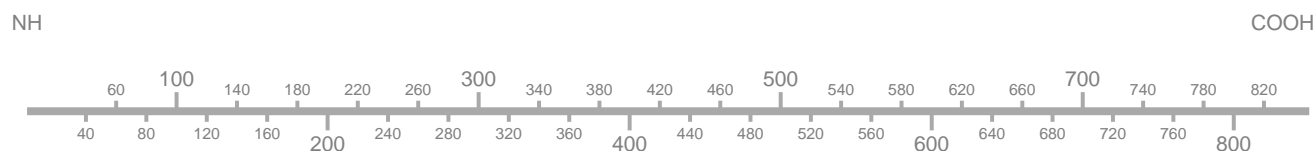
This track acts as a replacement for the `GenomeAxisTrack`. It comes with the same coloration, transparency and other customization options but loses the DNA representation for a simple segment.

```
pat <- ProteinAxisTrack()
plotTracks(pat, from = 1, to = 850)
```



Just like in `GenomeAxisTrack`, it is possible to use `littleTicks` to get a more precise scale. Moreover, because Pviz has been made to deal with peptides and protein, the option `addNc` can display indicators for N-term and C-term ends on the axis.

```
pat <- ProteinAxisTrack(addNC = TRUE, littleTicks = TRUE)
plotTracks(pat, from = 1, to = 850)
```



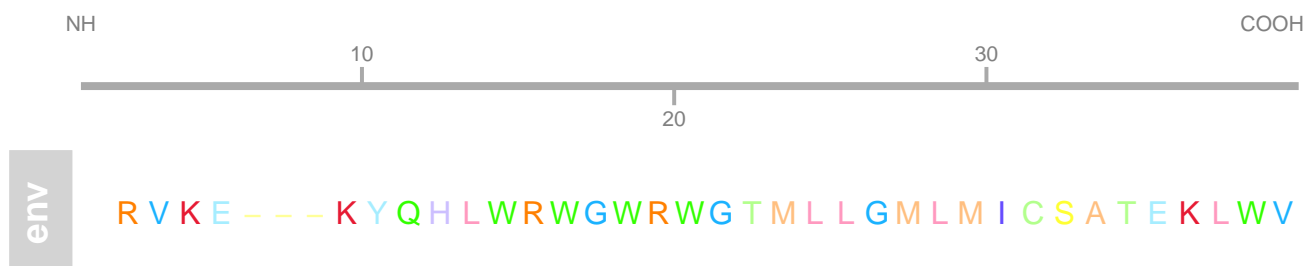
## 3.2 ProteinSequenceTrack

This new track simply displays a selected sequence. It can takes both `AAstring` or regular `character`.

Note that the first amino acid of the sequence should correspond to the first position of any other element you choose to display at the same time.

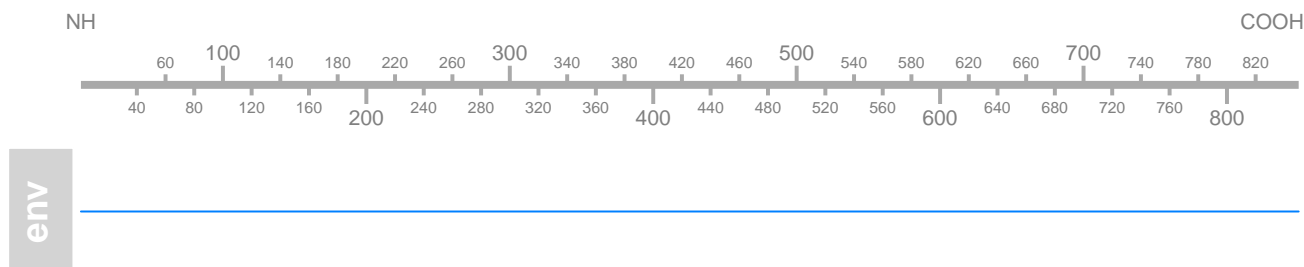
The previously loaded dataset also contains the sequence of the envelope of hxb2 to be used as an example.

```
st <- ProteinSequenceTrack(sequence = hxb2_seq, name = "env")
plotTracks(trackList = c(pat, st), from = 1, to = 40)
```



The sequence track for proteins handles overplotting the same way it does it for nucleotides. If the plotting range becomes wider, only the color code will be displayed. Once it becomes too big to even show these colors, a straight line will be displayed. Naturally, the character size will also influence what can be displayed in the graphic window.

```
st <- ProteinSequenceTrack(sequence = hxb2_seq, name = "env", cex = 0.5)
plotTracks(trackList = c(pat, st), from = 1, to = 850)
```



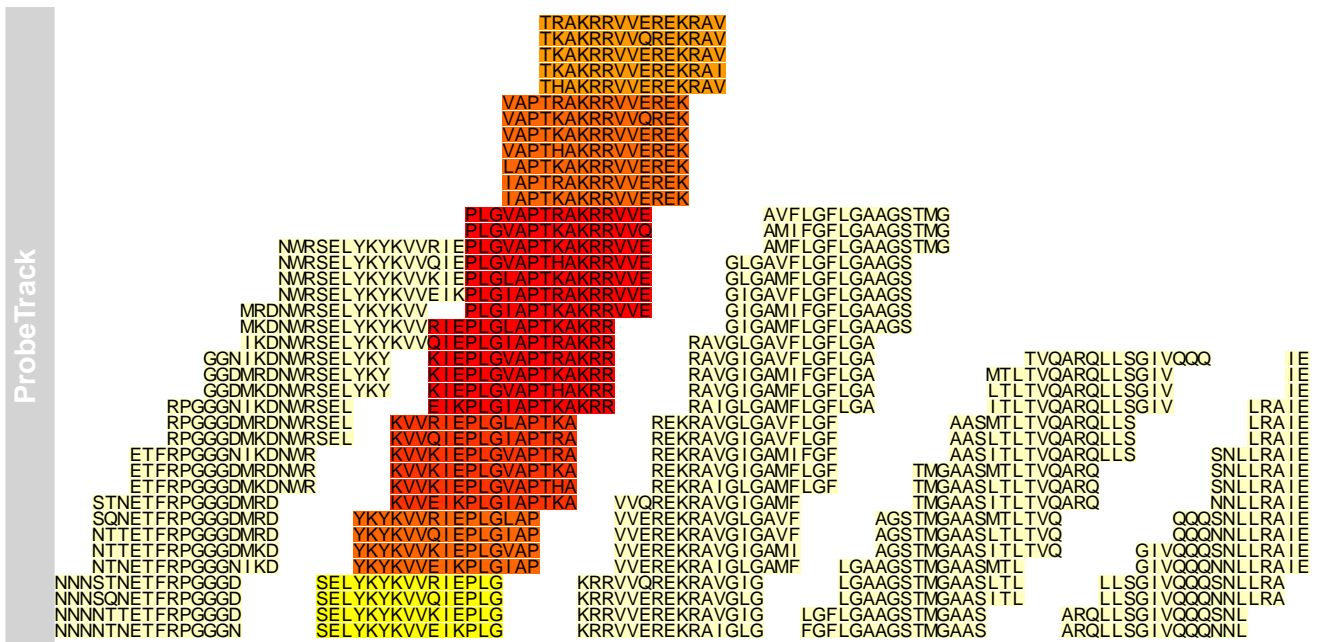
Although the character expansion has been set to less than 1. The ranges are still too wide for a correct display and only a straight line will be displayed.

### 3.3 ProbeTrack

This track is designed to display peptide microarray data. It draws each peptide relative to its position in the sequence and enclose them in rectangles colored depending on their frequency of binding event or intensity. It is useful to spot differences between clades at a specific position or get an overview of the regions with antibody binding activity, depending on the scale used while plotting.

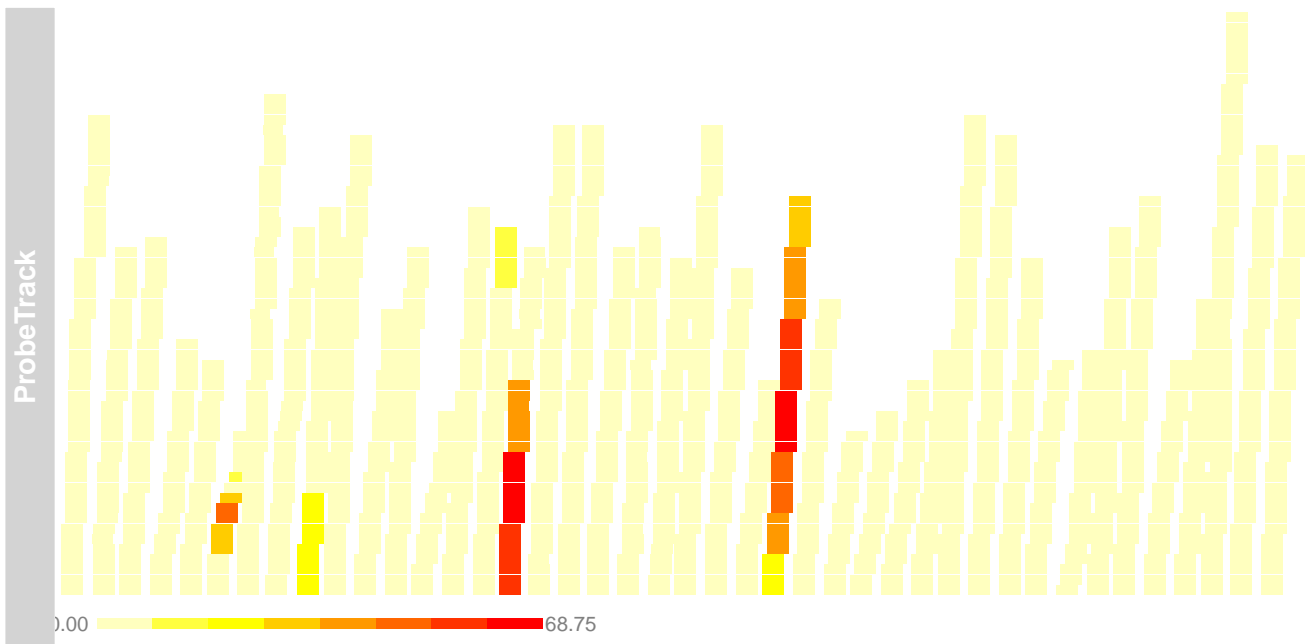
To create this track, the sequence of the peptides, their intensity or frequency and their starting position have to be passed as arguments. All three arguments should be of the same length.

```
pt <- ProbeTrack(pepEx, freqEx, startEx)
plotTracks(pt, from = 460, to = 560)
```



Unlike in ProteinSequenceTrack, the size of the characters in each peptide sequence depends on the plotting ranges (the user can still choose to change the size manually) and if the ranges become too wide, the characters will appear as dots or completely disappear instead of stacking on top of each other. While it loses the sequence information, it might be relevant to locate regions where peptides have high intensity/frequency.

```
plotTracks(pt, legend = TRUE)
```

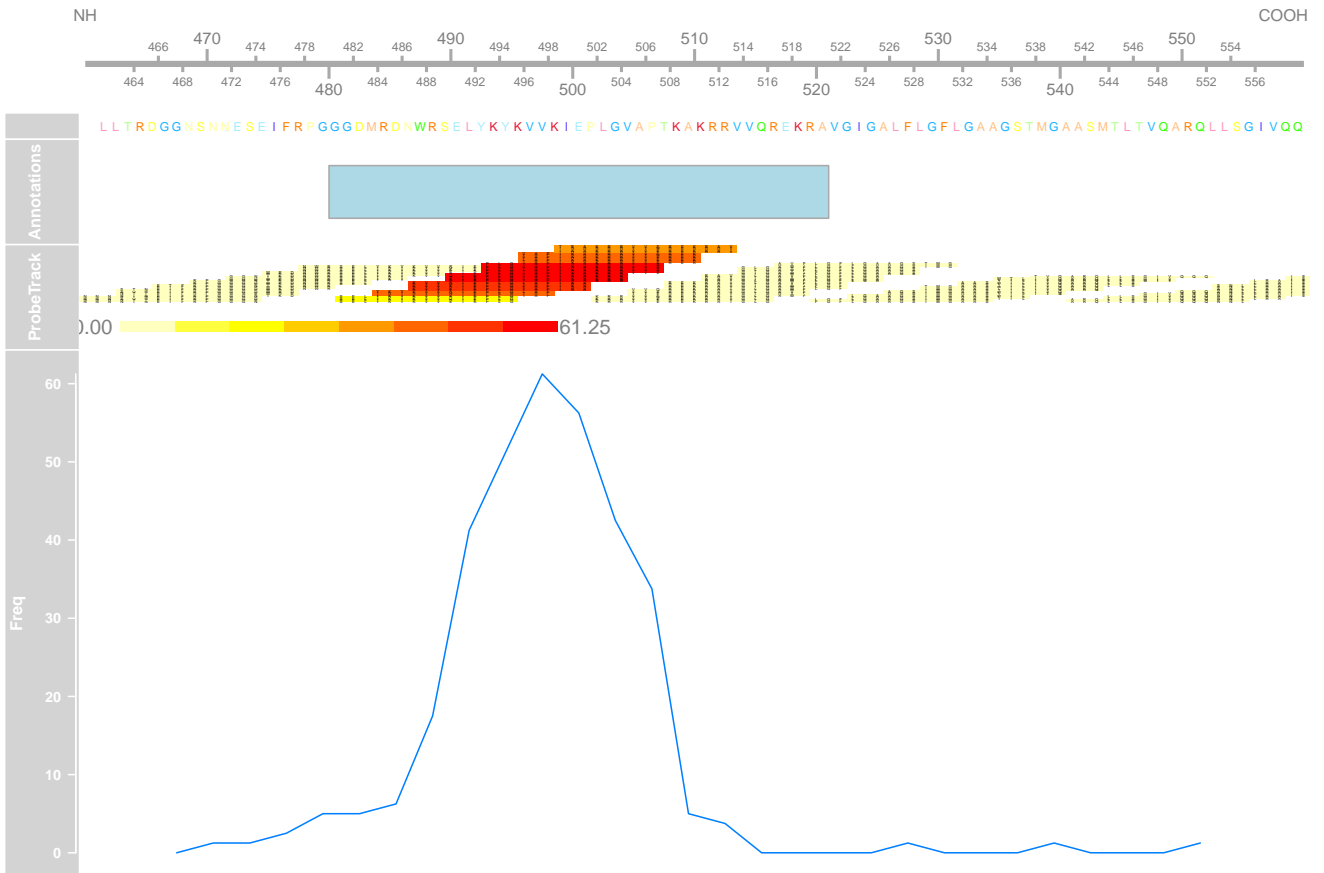


For a more explicit display, a legend has been implemented for this track and can be called during track creation or in the plotting function. The legend displays the scale of frequencies.

## 4 Example of plot

Naturally, the interest of Pviz, just like its parent Gviz is the display of multiple tracks at once. Here is an example of what Pviz can render, using the tracks previously created.

```
pt <- ProbeTrack(pepEx, freqEx, startEx, cex = 0.2)
plotTracks(trackList = c(pat, st, at, pt, dt), from = 460, to = 560, type = "l",
           legend = TRUE)
```



## 5 sessionInfo

```
sessionInfo()

## R Under development (unstable) (2014-03-28 r65330)
## Platform: x86_64-unknown-linux-gnu (64-bit)
##
## locale:
##  [1] LC_CTYPE=en_US.UTF-8      LC_NUMERIC=C
##  [3] LC_TIME=en_US.UTF-8      LC_COLLATE=en_US.UTF-8
##  [5] LC_MONETARY=en_US.UTF-8  LC_MESSAGES=en_US.UTF-8
##  [7] LC_PAPER=en_US.UTF-8     LC_NAME=C
##  [9] LC_ADDRESS=C             LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] parallel  grid      stats      graphics  grDevices  utils      datasets
## [8] methods   base
##
## other attached packages:
## [1] PEP.db_0.99.5      XVector_0.3.7      IRanges_1.21.36
## [4] Pviz_0.99.1        Gviz_1.7.10        BiocGenerics_0.9.3
## [7] knitr_1.5
##
## loaded via a namespace (and not attached):
##  [1] AnnotationDbi_1.25.17  BatchJobs_1.2
##  [3] BBmisc_1.5            Biobase_2.23.6
##  [5] BiocParallel_0.5.18    biomaRt_2.19.3
##  [7] Biostrings_2.31.18     biovizBase_1.11.13
##  [9] bitops_1.0-6          brew_1.0-6
## [11] BSgenome_1.31.12       cluster_1.15.1
## [13] codetools_0.2-8        colorspace_1.2-4
## [15] data.table_1.9.2       DBI_0.2-7
## [17] dichromat_2.0-0        digest_0.6.4
## [19] evaluate_0.5.1         fail_1.2
## [21] foreach_1.4.1          formatR_0.10
## [23] Formula_1.1-1          GenomeInfoDb_0.99.25
## [25] GenomicAlignments_0.99.32 GenomicFeatures_1.15.12
## [27] GenomicRanges_1.15.40  highr_0.3
## [29] Hmisc_3.14-3           iterators_1.0.6
## [31] labeling_0.2           lattice_0.20-27
## [33] latticeExtra_0.6-26     matrixStats_0.8.14
## [35] munsell_0.4.2          plyr_1.8.1
## [37] RColorBrewer_1.0-5     Rcpp_0.11.1
## [39] RCurl_1.95-4.1         reshape2_1.2.2
```



```
## [41] R.methodsS3_1.6.1      Rsamtools_1.15.35
## [43] RSQLite_0.11.4         rtracklayer_1.23.18
## [45] scales_0.2.3           sendmailR_1.1-2
## [47] splines_3.2.0          stats4_3.2.0
## [49] stringr_0.6.2          survival_2.37-7
## [51] tools_3.2.0            VariantAnnotation_1.9.46
## [53] XML_3.98-1.1           zlibbioc_1.9.0
```