Programming in R

Educational Materials
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Working with environments

- you can access data using: `get`, `[[`, `$`.
- you can not use a numeric index (it doesn’t make sense), you must extract items using their names.
- basic user functions accomplished with `get`: `get([key], [environment])`
  ```r
  > GOtags <- get("1001_at", env = hgu95av2G)
  ```
- if you have multiple keys, use `mget`, which will return a list
Lists and Environments

- Both allow you to store, together a collection of R objects of any type.
- List access is either by numeric index or name (if the items have names).
- Environment access is only by name.
- The environment can be hashed, or not. If you are going to store many things then hashing makes sense.
- In recent versions of R accessing list elements by name has been sped up (so the differences in performance between the two is not large).
- Environments are not copied when they are passed as values - so be careful.
Using Lists

- **list** is a very flexible storage format in R

```r
> x <- list()
> x[[1]] <- c(1, 2, 3)
> x[[2]] <- "foo"
> x[[3]] <- x
> names(x) <- c("bag", "nam", "lis")
> print(x)

$bag
[1] 1 2 3

$nam
[1] "foo"

$lis
$lis[[1]]
[1] 1 2 3

$lis[[2]]
[1] "foo"
```
List Element Access

> x[[1]]
[1] 1 2 3

> x[["bag"]]
[1] 1 2 3

> x$bag
[1] 1 2 3

> x["bag"]
$bag
[1] 1 2 3
Environments - Insertion

You can do the same things with an environment, but you must give all objects a name. We first create an environment and then populate it.

```r
> e1 = new.env(hash = TRUE)
> e1$bag = c(1, 2, 3)
> e1$nam = "foo"
> e1$lis = x
```
Environments - Extraction

To get the elements back out we can use the same operators.

\[
\begin{align*}
> & \ e1$nam \\
& [1] \ "foo" \\
> & \ e1[["bag"]]
& [1] 1 2 3 \\
> & \ \text{get("nam", env = e1)}
& [1] \ "foo" \\
> & \ ls(env = e1)
& [1] \ "bag" \ "lis" \ "nam" \\
> & \ zz = as.list(e1)
\end{align*}
\]
Environments

Most of the Bioconductor meta-data packages are stored in environments. You can use the operators described above to get data out of an environment in a meta-data package.

```r
> hgu95av2SYMBOL

<environment: 0x699bc08>

> ls(hgu95av2SYMBOL)[1:5]

[1] "1000_at" "1001_at" "1002_f_at" "1003_s_at" "1004_at"

> get("1001_at", env = hgu95av2GO)

"GO:0004714"$GOID
[1] "GO:0004714"

"GO:0004714"$Evidence
[1] "TAS"

"GO:0004714"$Ontology
```
Environments

Some other operations that can be performed on environments.

• They can be locked or sealed. This means that no new bindings can be added (lockEnvironment).
• eapply will be in the next release of R
• DPExplorer form the tkWidgets package can be used to explore these data.