

# proto reference card

## Creation

**proto** `proto(.., expr, envir, ...)` embeds the components specified in **expr** and/or `...` into the **proto** object or environment specified by **envir**. A new object is created if **envir** is omitted. The parent of the object is set to `..`. The parent object, `..`, defaults to the parent of **envir** or the current environment if **envir** is missing. **expr** and `...` default to empty specifications. The returned object will contain `.that` and `.super` variables referring to the object itself and the parent of the object, respectively.

## Coercion

**as.proto** If **x** is a **proto** object or environment then **x** is returned as a **proto** object with the values of `.that` and `.super` inserted in the case of an environment or refreshed in the case of a **proto** object. If **x** is a list then additional arguments are available: `as.proto(x, envir, parent, FUN, all.names, ...)`. Each component of **x** is copied into **envir**. **envir** may be an **environment** or **proto** object. If it is missing a new **proto** object is created. If `all.names = FALSE` then only list components whose names do not begin with a dot are copied. If **FUN** is specified then, in addition, only list components **v** for which `FUN(v)` is **TRUE** are copied. If **parent** is specified then the resulting **proto** object will have that parent. Otherwise, it will have the parent of **envir** if **envir** was specified. If neither are specified the parent defaults to the current environment.

## Standard methods

**\$** `obj$x` searches **proto** object **obj** for **x**. If the name **x** does not begin with two dots then ancestors are searched if the name is not found in **obj**. If **x** is a variable or if **obj** is `.super` or `.that` then **x** is returned. Otherwise, the call `obj$x(...)` is equivalent to the call `get("x", obj)(obj, ...)`. If it is desired to return a method as a value rather than in the context of a call then use `get("x", obj)` (or `obj[["x"]]`) **x** is known to be directly in **obj** rather than **\$** syntax.

**\$<-** `obj$x <- value` sets **x** in **proto** object **obj** to **value** creating **x** if not present. If **obj** is `.super` then a side effect is to set the parent of **obj** to **value**.

**is.proto(x)** returns **TRUE** if **x** is a **proto** object and otherwise returns **FALSE**.

## Utilities

**graph.proto** `graph.proto(e, g, child.to.parent)` adds a graph in the sense of the **graph** package representing an ancestor tree among all **proto** objects in **environment** or **proto** object **e** to graph **g**. **e** defaults to the current environment and **g** defaults to an empty graph. **child.to.parent** is a logical variable specifying the direction of arrows. By default they are displayed from children to parents.