photobiologyFilters Version 0.2.0
User Guide

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1 Introduction

We have developed a set of packages to facilitate the calculation of many different quantities that can be derived from spectral irradiance data. The basic package is called photobiology, and the package described here adds transmittance data for some frequently used filters, and a function for interpolating.

2 Installation and use

The functions in the package photobiologyFilters are made available by installing the packages `photobiologyFilter` (once) and loading it from the library when needed.

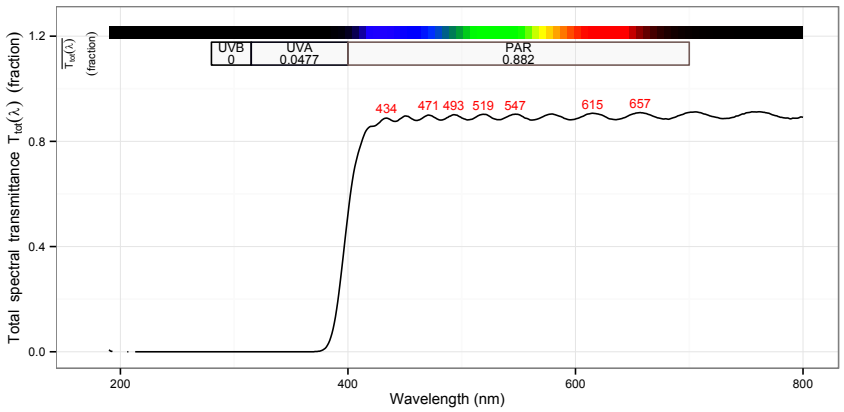
To load the package into the workspace we use `library(photobiologyFilter)`.

```
library(photobiology)
library(photobiologygg)
library(photobiologyFilters)
library(ggplot2)
```

3 Plotting the transmittance spectrum of a filter

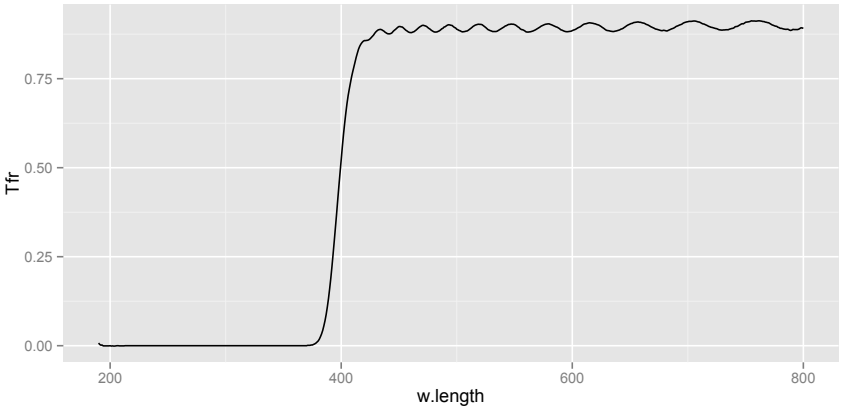
We can plot the data as is, accepting all defaults. As the returned value is a ggplot object, we can modify and add to it as needed.

```
plot(uv.226.new.spct) + theme_bw(10)
```



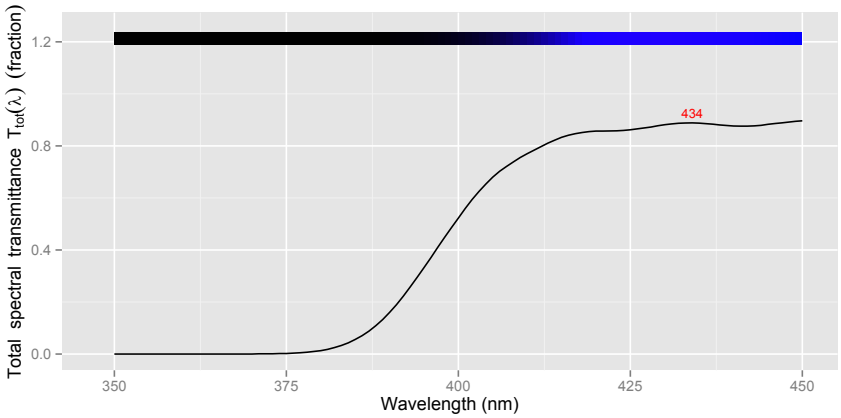
We can also use ggplot (or lattice or base graphics functions) to plot the spectrum.

```
ggplot(data=uv.226.new.spct, aes(x=w.length, y=Tfr)) + geom_line()
```

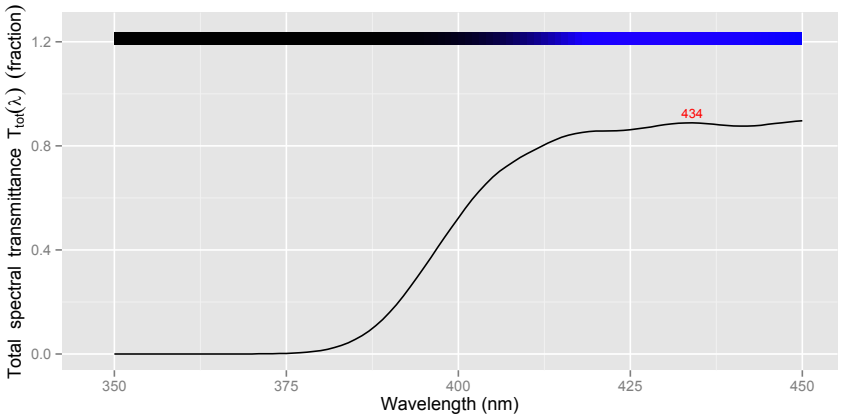


If we would like to use a different range of wavelengths, then we can build a new filter.spct by trimming.

```
cp.uv.226.spct <- copy(uv.226.new.spct)
my.uv.226.spct <-
  trim_spct(cp.uv.226.spct, range = c(350,450))
plot(my.uv.226.spct)
```



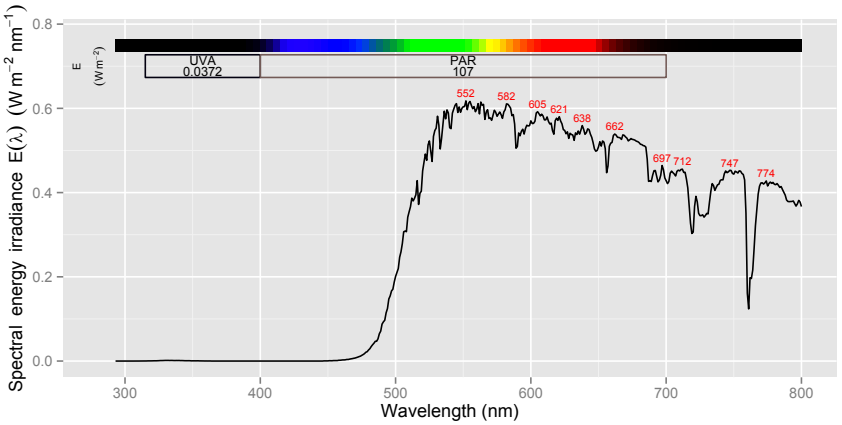

```
my.uv.226.spct <-
  interpolate_spct(cp.uv.226.spct, w.length.out = c(350,450), length=201)
plot(my.uv.226.spct)
```



4 Convoluting spectral irradiance with filter transmittace

The easy way.

```
plot(sun.spct * canary.yellow.new.spct)
```




```
canary.spct <- sun.spct * canary.yellow.new.spct
canary.spct[ , filter := "canary"]

##      w.length    s.e.irrad filter
##   1:      293 0.000000e+00 canary
##   2:      294 0.000000e+00 canary
##   3:      295 0.000000e+00 canary
##   4:      296 3.390059e-08 canary
##   5:      297 7.667453e-08 canary
##  ---
## 504:      796 3.678676e-01 canary
## 505:      797 3.731224e-01 canary
## 506:      798 3.814771e-01 canary
## 507:      799 3.773543e-01 canary
## 508:      800 3.668253e-01 canary

polyester.spct <- sun.spct * polyester.new.spct
polyester.spct[ , filter := "polyester"]

##      w.length    s.e.irrad    filter
##   1:      293 7.828995e-09 polyester
##   2:      294 1.842720e-08 polyester
##   3:      295 6.528525e-08 polyester
##   4:      296 2.034036e-07 polyester
##   5:      297 4.600472e-07 polyester
##  ---
## 504:      796 3.705200e-01 polyester
## 505:      797 3.764354e-01 polyester
## 506:      798 3.855015e-01 polyester
## 507:      799 3.809123e-01 polyester
## 508:      800 3.706909e-01 polyester

no.226.spct <- sun.spct * uv.226.new.spct
no.226.spct[ , filter := "no226"]

##      w.length s.e.irrad filter
##   1:      293 0.0000000  no226
##   2:      294 0.0000000  no226
##   3:      295 0.0000000  no226
```

```
##   4:      296 0.0000000  no226
##   5:      297 0.0000000  no226
##  ---
## 504:      796 0.3627668  no226
## 505:      797 0.3689812  no226
## 506:      798 0.3782999  no226
## 507:      799 0.3735871  no226
## 508:      800 0.3627563  no226
```

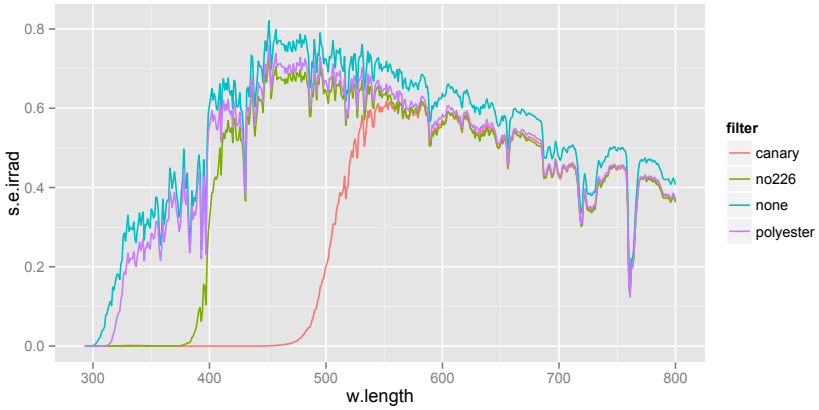
```
my.sun.spct <- copy(sun.spct)
my.sun.spct[ , filter := "none"]
```

```
##      w.length    s.e.irrad    s.q.irrad filter
##   1:      293 2.609665e-06 6.391730e-12   none
##   2:      294 6.142401e-06 1.509564e-11   none
##   3:      295 2.176175e-05 5.366385e-11   none
##   4:      296 6.780119e-05 1.677626e-10   none
##   5:      297 1.533491e-04 3.807181e-10   none
##  ---
## 504:      796 4.080616e-01 2.715219e-06   none
## 505:      797 4.141204e-01 2.758995e-06   none
## 506:      798 4.236281e-01 2.825879e-06   none
## 507:      799 4.185850e-01 2.795738e-06   none
## 508:      800 4.069055e-01 2.721132e-06   none
```

```
all.spct <- rbindspct(list(canary.spct, polyester.spct, no.226.spct, my.sun.spct))
setTimeUnit(all.spct)
```

```
##       w.length    s.e.irrad    filter    s.q.irrad
##    1:      293 0.000000e+00    canary           NA
##    2:      293 7.828995e-09 polyester           NA
##    3:      293 0.000000e+00     no226           NA
##    4:      293 2.609665e-06      none 6.391730e-12
##    5:      294 0.000000e+00    canary           NA
##   ---
## 2028:      799 4.185850e-01      none 2.795738e-06
## 2029:      800 3.668253e-01    canary           NA
## 2030:      800 3.706909e-01 polyester           NA
## 2031:      800 3.627563e-01     no226           NA
## 2032:      800 4.069055e-01      none 2.721132e-06
```

```
ggplot(data=all.spct, aes(x=w.length, y=s.e.irrad, colour=filter)) + geom_line()
```

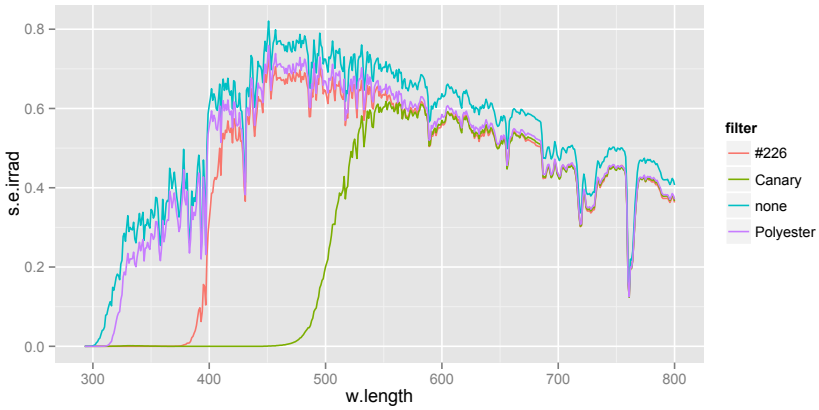


The difficult way, which could execute faster.

```
data(sun.spct)
attach(sun.spct)
```

```
canary.s.irrad <- s.e.irrad * calc_filter_multipliers(w.length, "canary.yellow.new")
polyester.s.e.irrad <- s.e.irrad * calc_filter_multipliers(w.length, "polyester.new")
uv.226.s.e.irrad <- s.e.irrad * calc_filter_multipliers(w.length, "uv.226.new")
filtered.sun.data <- data.frame(w.length=rep(w.length, 4),
                                s.e.irrad=c(s.e.irrad, canary.s.irrad, polyester.s.e.irrad, uv.226.s.e.irrad),
                                filter=factor(rep(c("none", "Canary", "Polyester", "#226"),
                                                  rep(length(w.length), 4))))
```

```
ggplot(data=filtered.sun.data, aes(x=w.length, y=s.e.irrad, colour=filter)) + geom_line()
```




```
detach(sun.spct)
```