photobiologyFilters Version 0.4.0
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 Calculating average transmittance

```
uv.226.new.spct <- rosco.mspct$UV_filter_EColour226
transmittance(uv.226.new.spct, UV_bands())

##  UVC.ISO.tr.lo        UVB.ISO        UVA.ISO
##   0.0001290556   0.0000100000   0.0476859412
## attr(,"Tfr.type")
## [1] "total"
## attr(,"radiation.unit")
## [1] "transmittance average"
```

```
transmittance(uv.226.new.spct, PAR())

##       PAR
## 0.8819025
## attr(,"Tfr.type")
## [1] "total"
## attr(,"radiation.unit")
## [1] "transmittance average"
```

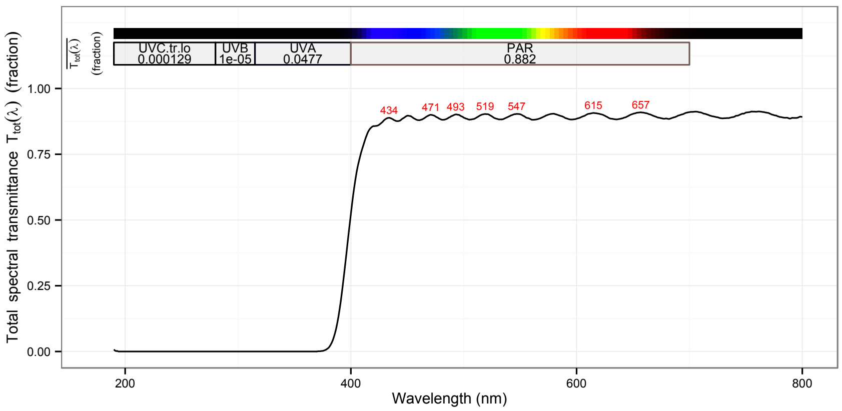
```
absorbance(uv.226.new.spct, PAR())

##        PAR
## 0.05526775
## attr(,"Tfr.type")
## [1] "total"
## attr(,"radiation.unit")
## [1] "absorbance average"
```

4 Plotting the transmittance spectrum of filters

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.

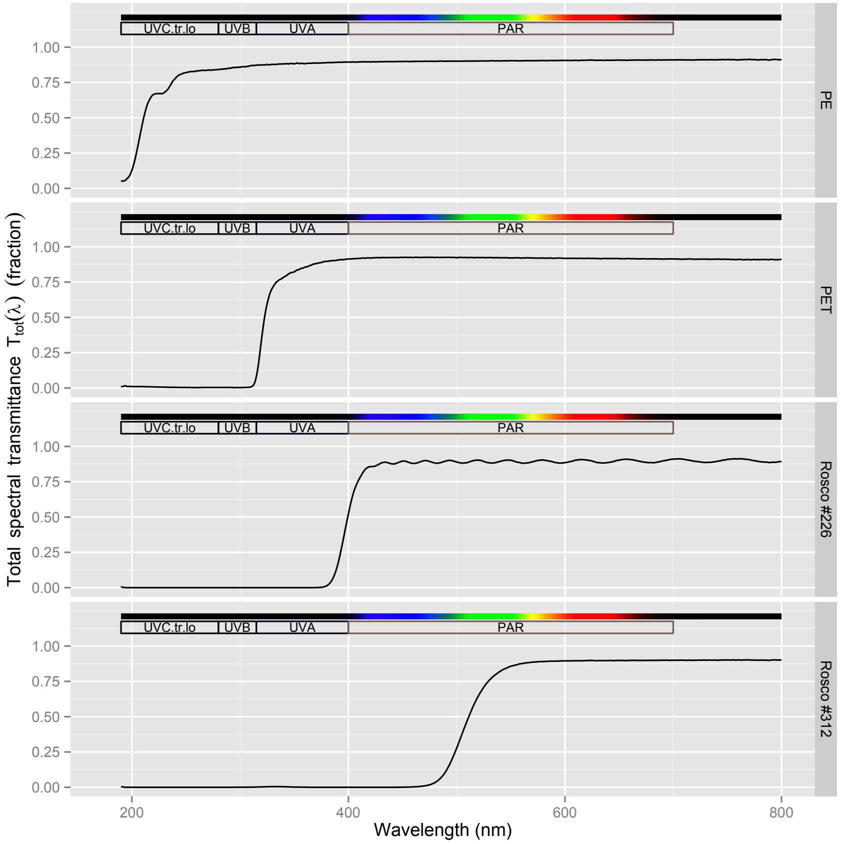
```
plot(uv.226.new.spct) + theme_bw(10)
```



We can also row-bind several spectra and plot them in panels.

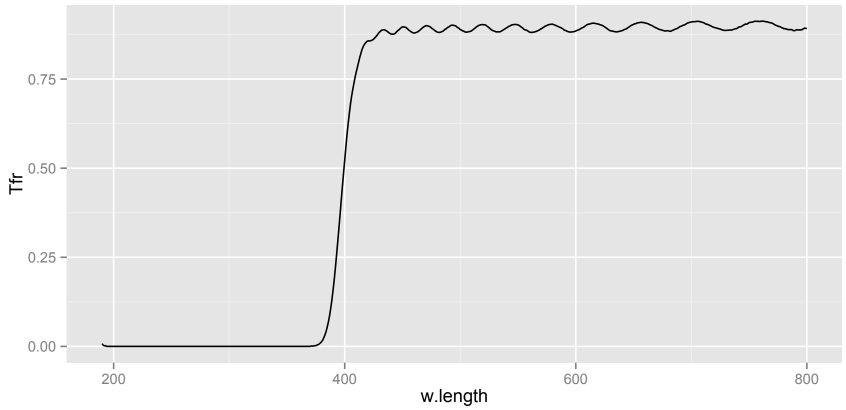
```
filters.spct <- rbindspct(list(PE = etola.mspct$Clear_LD_PE_50um,
                               PET = mcdermit.mspct$Autostat_CT5_125um,
                               'Rosco #226' = rosco.mspct$UV_filter_EColour226,
                               'Rosco #312' = rosco.mspct$Canary_Supergel312),
                          idfactor = "filter")
```

```
plot(filters.spct,
     annotations = c("colour.guide", "boxes", "labels")) +
  facet_grid(filter˜.)
```



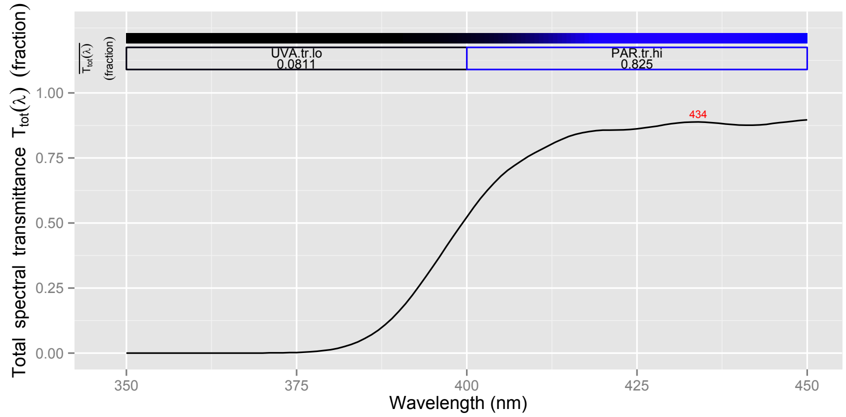
We can also use ggplot (or lattice or base graphics functions) to plot the spectrum.

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



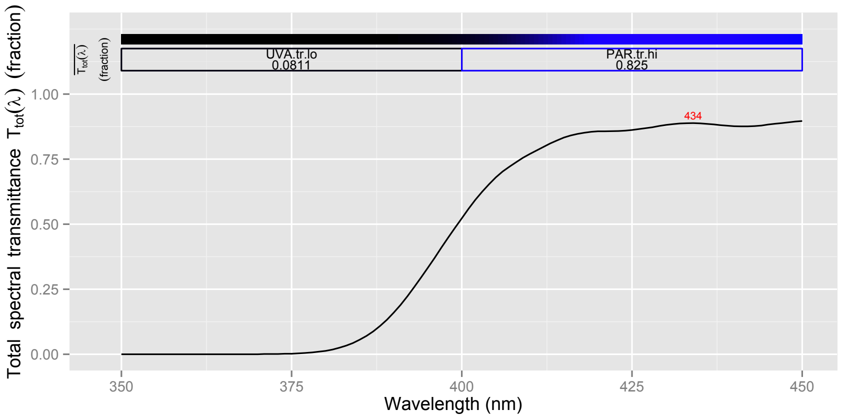
If we would like to use a different range of wavelengths for several calculations, then we can build a new filter.spct by trimming.

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



However, if we only would like to limit the range of wavelengths in the plot, it is even easier to use the `range` formal argument of function `plot` to obtain the same plot.

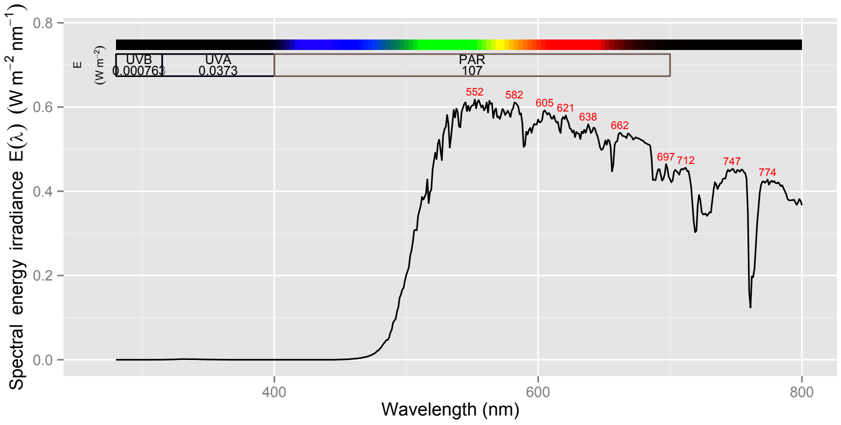
```
plot(uv.226.new.spct, range = c(350, 450))
```



5 Convoluting spectral irradiance with filter transmittance

To simulate the spectral irradiance of a filtered light source we convolute the bare source's irradiance spectrum with the filter transmittance spectrum.

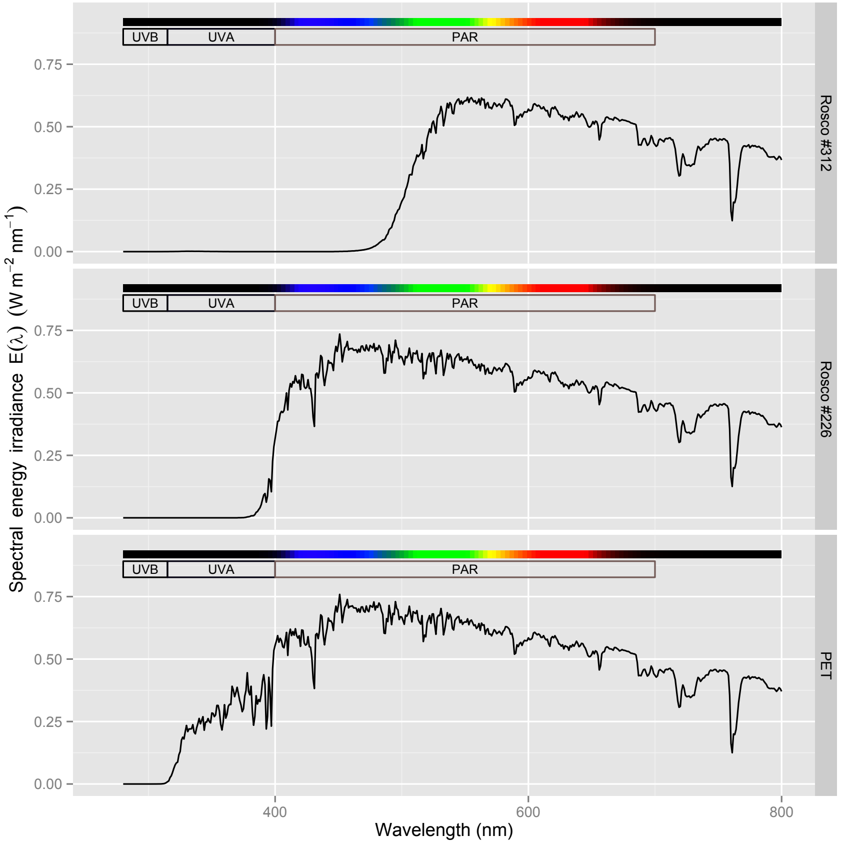
```
plot(sun.spct * rosco.mspct$Canary_Supergel312)
```



If we want to compare the effect of several filters on the spectrum of a light source we can create a combined spectral object by row-binding the source.spct objects obtained as a result of the convolutions.

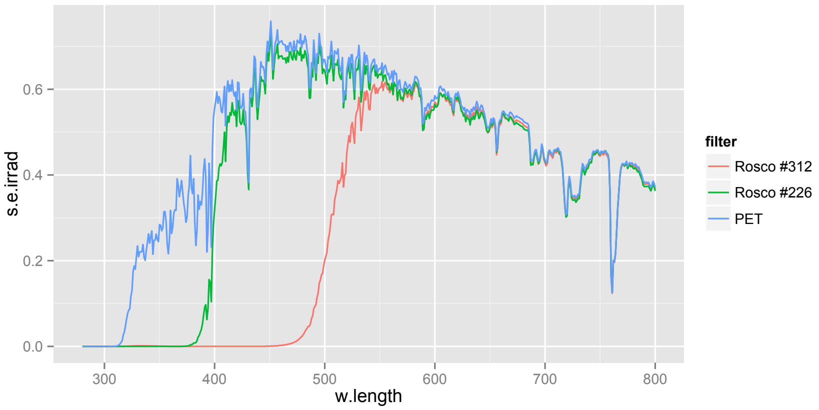
```
all.spct <-
  rbindspct(list('Rosco #312' = sun.spct * rosco.mspct$Canary_Supergel312,
                 'Rosco #226' = sun.spct * rosco.mspct$UV_filter_EColour226,
                 PET = sun.spct * mcdermit.mspct$Autostat_CT5_125um),
            idfactor = "filter")
```

```
plot(all.spct, annotations = c("colour.guide", "boxes", "labels")) + facet_grid(filter~.)
```



If we would like the different spectra plotted on a single panel, we can use, for example, package `ggplot2`.

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


s.e.irrad
w.length
filter
Rosco #312
Rosco #226
PET