

# Package: colorscience (via r-universe)

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**Title** Color Science Methods and Data

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**Maintainer** Glenn Davis <gdavis@gluonics.com>

**Description** Methods and data for color science - color conversions by observer, illuminant, and gamma. Color matching functions and chromaticity diagrams. Color indices, color differences, and spectral data conversion/analysis. This package is deprecated and will someday be removed; for reasons and details please see the README file.

**License** GPL (>= 3)

**Depends** R (>= 2.10), Hmisc, pracma, sp

**LazyData** yes

**Author** Jose Gama [aut], Glenn Davis [aut, cre]

**NeedsCompilation** no

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ASTM.D1925.YellownessIndex  
*ASTM D 1925 Yellowness Index for Plastics*

**Description**

ASTM.D1925.YellownessIndex was developed for the definition of the Yellowness of homogeneous, non-fluorescent, almost neutral-transparent, white-scattering or opaque plastics as they will be reviewed under daylight condition.

**Usage**

ASTM.D1925.YellownessIndex(XYZmatrix)

**Arguments**

XYZmatrix      tri-stimulus values for the calculated for illuminant C

**Author(s)**

Jose Gama

**Source**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**References**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**Examples**

XYZ<-c(0.1146538, 0.08391198, 0.08222077)  
ASTM.D1925.YellownessIndex(XYZ)

---

ASTM.E313.Whiteness     *ASTM E313 Whiteness*

---

**Description**

ASTM.E313.Whiteness ASTM E313 Whiteness.

**Usage**

ASTM.E313.Whiteness(XYZmatrix)

**Arguments**

XYZmatrix     tri-stimulus values for the calculated for illuminant C

**Author(s)**

Jose Gama

**Source**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**References**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**Examples**

XYZ<-c(0.1146538, 0.08391198, 0.08222077)  
ASTM.E313.Whiteness(XYZ)

---

ASTM.E313.YellownessIndex  
*ASTM E313 Yellowness*

---

**Description**

ASTM.E313.YellownessIndex ASTM E313 has successfully been used for a variety of white or near white materials.

**Usage**

ASTM.E313.YellownessIndex(XYZmatrix)

**Arguments**

XYZmatrix      tri-stimulus values for the calculated for illuminant C

**Author(s)**

Jose Gama

**Source**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**References**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**Examples**

```
XYZ<-c(0.1146538, 0.08391198, 0.08222077)
ASTM.E313.YellownessIndex(XYZ)
```

---

Berger59.Whiteness      *Berger (59) Whiteness*

---

**Description**

Berger59.Whiteness formula was developed by A. Berger (formerly employee of Bayer AG, Germany and was presented in 1959.

**Usage**

```
Berger59.Whiteness(xyYmatrix, illuminant = "C", observer = 2, RefWhite =
  get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

xyYmatrix	CIE values for illuminant C
illuminant	illuminant
observer	observer
RefWhite	White Reference

**Author(s)**

Jose Gama

**Source**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**References**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**Examples**

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
Berger59.Whiteness(xyY)
```

---

BVR2XYZ

*convert from BVR coordinates to XYZ temperature (Robertson)*

---

**Description**

BVR2XYZ convert from BVR coordinates to XYZ.

**Usage**

```
BVR2XYZ(BVRmatrix)
```

**Arguments**

BVRmatrix	BVR coordinates
-----------	-----------------

**Value**

XYZ coordinates



**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**References**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

---

cccie31

*CIE (1931) 2-deg chromaticity coordinates*

---

**Description**

cccie31 is a table with CIE (1931) 2-deg chromaticity coordinates.

**Usage**

cccie31

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)

**x** x chromaticity coordinate

**y** y chromaticity coordinate

**z** z chromaticity coordinate

**Author(s)**

Jose Gama

**Source**

Commission Internationale de l'Eclairage Proceedings, 1931 Cambridge: Cambridge University Press.

**References**

Commission Internationale de l'Eclairage Proceedings, 1931 Cambridge: Cambridge University Press.

**Examples**

```
data(cccie31)
cccie31
```

---

cccie64

*CIE (1964) 10-deg chromaticity coordinates*

---

**Description**

cccie64 is a table with CIE (1964) 10-deg chromaticity coordinates.

**Usage**

```
cccie64
```

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)  
**x** x chromaticity coordinate  
**y** y chromaticity coordinate  
**z** z chromaticity coordinate

**Author(s)**

Jose Gama

**Source**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**References**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**Examples**

```
data(cccie64)
cccie64
```

---

CCT2XYZ	<i>Convert CCT to XYZ</i>
---------	---------------------------

---

**Description**

CCT2XYZ Converts correlated color temperature (CCT) to CIE tristimulus XYZ.

**Usage**

CCT2XYZ(CCTmatrix)

**Arguments**

CCTmatrix      CCT values

**Value**

CIE tristimulus XYZ

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com/>

**References**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com/>

**Examples**

CCT2XYZ(c(0.310897, 0.306510, 74.613450))

---

CentralsISCCNBS	<i>Central notations for the revised ISCC-NBS</i>
-----------------	---

---

**Description**

CentralsISCCNBS is a table with Central notations for the revised ISCC-NBS Color-Name Blocks.

**Usage**

CentralsISCCNBS

**Format**

This data frame contains the following data:

**Number** notation number

**Name** notation name

**MunsellSpec** Munsell specification

**Author(s)**

Glenn Davis

**References**

Kelly, Kenneth Low, 1910 Central notations for the revised ISCC-NBS Color-Name Blocks Journal of Research of the National Bureau of Standards Research Paper 2911, Vol. 61 No. 5, November 1958

**Examples**

```
data(CentralsISCCNBS)
CentralsISCCNBS
```

---

CheckColorLookup      *Check that the color block number is correct*

---

**Description**

CheckColorLookup Checks that the color block number is correct.

**Usage**

```
CheckColorLookup(DataISCCNBS)
```

**Arguments**

DataISCCNBS      data.frame with columns MunsellSpec and Number

**Value**

logic

**Author(s)**

Glenn Davis

---

ChromaticAdaptation    *Chromatic adaptation algorithms*

---

**Description**

ChromaticAdaptation chromatic adaptation algorithms implemented as a linear transformation (XYZ Scaling, Bradford and Von Kries).

**Usage**

ChromaticAdaptation

**Format**

This array frame contains the following dimensions:

- 1 rows transformation matrix 3x3
- 2 columns transformation matrix 3x3
- 3 linear transformation (XYZ Scaling, Bradford or Von Kries)
- 4 transformation "direct" or "inverse"

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com/>

**References**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com/>

**Examples**

```
data(ChromaticAdaptation)
ChromaticAdaptation
```

---

chromaticity.diagram *Plot the chromaticity diagram*

---

### Description

chromaticity.diagram Plots the chromaticity diagram AKA "horse shoe".

### Usage

```
chromaticity.diagram(chromaticityCoordinates=get("cccie31", envir = environment()),
  conversionFunction=NULL, ...)
```

### Arguments

chromaticityCoordinates  
                                   chromaticity coordinates

conversionFunction  
                                   optional function to perform the coordinate conversion

...  
                                   optional parameters for the plot command

### Value

none

### Author(s)

Jose Gama

### Examples

```
chromaticity.diagram()
xl<-yl<-0:1
chromaticity.diagram(xlim=xl,ylim=yl)
chromaticity.diagram(conversionFunction=CIE1931XYZ2CIE1976uv, xlim=xl,ylim=yl,
  xlab="u",ylab="v")
```

---

chromaticity.diagram.color

*Plot the chromaticity diagram line with color*

---

### Description

chromaticity.diagram.color Plots the chromaticity diagram AKA "horse shoe", as a black line, a color line or a polygon.

**Usage**

```
chromaticity.diagram.color(chromaticityCoordinates=get("cccie31", envir = environment()),
  conversionFunction=NULL, granularity=10, ...)
```

**Arguments**

```
chromaticityCoordinates      chromaticity coordinates
conversionFunction           optional function to perform the coordinate conversion
granularity                  granularity = number of calculated points
...                          optional parameters for the plot command
```

**Value**

none

**Author(s)**

Jose Gama

**Examples**

```
chromaticity.diagram.color()
xl<-yl<-0:1
chromaticity.diagram.color(xlim=xl,ylim=yl)
chromaticity.diagram.color(conversionFunction=CIE1931XYZ2CIE1976uv, xlim=xl,
  ylim=yl,xlab="u'",ylab="v'")
```

---

CIE.Whiteness

*CIE Whiteness*

---

**Description**

CIE.Whiteness The CIE Whiteness index is widely used in the industry for D65 for 2 or 10 deg observer.

**Usage**

```
CIE.Whiteness(xyYmatrix, illuminant = "D65", observer = 2, RefWhite
  = get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

```
xyYmatrix      xyY data
illuminant     illuminant
observer       observer
RefWhite       Reference White
```

**Author(s)**

Jose Gama

**Source**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**References**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**Examples**

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
CIE.Whiteness(xyY)
```

---

CIE1931xy2CIE1960uv     *Convert CIE 1931 xy color space to CIE 1960 uv color space*

---

**Description**

CIE1931xy2CIE1960uv Converts CIE 1931 xy color space to CIE 1960 uv color space.

**Usage**

```
CIE1931xy2CIE1960uv(xymatrix)
```

**Arguments**

xymatrix     xy coordinates

**Value**

CIE 1960 uv coordinates

**Author(s)**

Jose Gama

**Source**

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)



**References**

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

**Examples**

```
xyY <- cbind(0.4083308, 0.2988462, 0.08391198)
CIE1931xy2CIE1960uv(xyY)
```

---

CIE1931xy2CIE1976uv     *Convert CIE 1931 xy color space to CIE 1976 uv color space*

---

**Description**

CIE1931xy2CIE1976uv Converts CIE 1931 xy color space to CIE 1976 uv color space.

**Usage**

```
CIE1931xy2CIE1976uv(xymatrix)
```

**Arguments**

xymatrix     xy coordinates

**Value**

CIE 1976 uv coordinates

**Author(s)**

Jose Gama

**Source**

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

**References**

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

**Examples**

```
xyY <- cbind(0.4083308, 0.2988462, 0.08391198)
CIE1931xy2CIE1976uv(xyY)
```

---

CIE1931XYZ2CIE1931xyz *Convert CIE 1931 XYZ color space to CIE 1931 xyz color space*

---

**Description**

CIE1931XYZ2CIE1931xyz Converts CIE 1931 XYZ color space to CIE 1931 xyz color space.

**Usage**

CIE1931XYZ2CIE1931xyz(XYZmatrix)

**Arguments**

XYZmatrix      XYZ coordinates

**Value**

CIE 1931 xyz coordinates

**Author(s)**

Jose Gama

**Source**

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

**References**

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

**Examples**

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
CIE1931XYZ2CIE1931xyz(XYZ)
```

---

CIE1931XYZ2CIE1960uv *Convert CIE 1931 XYZ color space to CIE 1960 uv color space*

---

**Description**

CIE1931XYZ2CIE1960uv Converts CIE 1931 XYZ color space to CIE 1960 uv color space.

**Usage**

CIE1931XYZ2CIE1960uv(XYZmatrix)

**Arguments**

XYZmatrix      XYZ coordinates

**Value**

CIE 1960 uv coordinates

**Author(s)**

Jose Gama

**Source**

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

**References**

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

**Examples**

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
CIE1931XYZ2CIE1960uv(XYZ)
```

---

CIE1931XYZ2CIE1976uv *Convert CIE 1931 XYZ color space to CIE 1976 uv color space*

---

### Description

CIE1931XYZ2CIE1976uv Converts CIE 1931 XYZ color space to CIE 1976 uv color space.

### Usage

```
CIE1931XYZ2CIE1976uv(XYZmatrix)
```

### Arguments

XYZmatrix      XYZ coordinates

### Value

CIE 1976 uv coordinates

### Author(s)

Jose Gama

### Source

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

### References

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

### Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
CIE1931XYZ2CIE1976uv(XYZ)
```

---

CIE1960UCS2CIE1964      *Convert CIE 1960 UCS color space to CIE 1964 color space*

---

**Description**

CIE1960UCS2CIE1964 Converts CIE 1960 UCS color space to CIE 1964 color space.

**Usage**

```
CIE1960UCS2CIE1964(uvYmatrix, illuminant = "D65", observer = 2, RefWhite =  
get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

uvYmatrix	uvY data
illuminant	illuminant
observer	observer
RefWhite	Reference White

**Value**

CIE 1976 uv coordinates

**Author(s)**

Jose Gama

**Source**

Wikipedia, 2014 CIE 1964 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

**References**

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

**Examples**

```
CIE1960UCS2CIE1964(c(0.1633789, 1.322222, 0.08391198))
```

---

CIE1960UCS2xy

*Convert CIE 1960 UCS color space to 1960 xy color space*

---

### **Description**

CIE1960UCS2xy Converts CIE 1960 UCS color space to 1960 xy color space.

### **Usage**

CIE1960UCS2xy(uvMatrix)

### **Arguments**

uvMatrix          uv coordinates

### **Value**

CIE 1960 xy coordinates

### **Author(s)**

Jose Gama

### **Source**

Wikipedia, 2014 CIE 1964 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

### **References**

Wikipedia, 2014 CIE 1931 color space [https://en.wikipedia.org/wiki/CIE\\_1931\\_color\\_space#CIE\\_xy\\_chromaticity\\_diagram\\_and\\_the\\_CIE\\_xyY\\_color\\_space](https://en.wikipedia.org/wiki/CIE_1931_color_space#CIE_xy_chromaticity_diagram_and_the_CIE_xyY_color_space)

### **Examples**

CIE1960UCS2xy(c(0.1633789, 1.322222 ))

---

CIE1976chroma

*CIE 1976 chroma formula for CIELab and CIELuv*

---

**Description**

CIE1976chroma CIE 1976 chroma formula for CIELab and CIELuv.

**Usage**

CIE1976chroma(CIELMatrix)

**Arguments**

CIELMatrix      CIELab or CIELuv data

**Author(s)**

Jose Gama

**Source**

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

**References**

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

**Examples**

```
CIELMatrix<-c(34.78467, 28.15159, 3.024663)
CIE1976chroma(CIELMatrix)
```

---

CIE1976hueangle

*CIE 1976 hue angle formula for CIELab and CIELuv*

---

**Description**

CIE1976hueangle CIE 1976 hue angle formula for CIELab and CIELuv.

**Usage**

CIE1976hueangle(CIELMatrix)

**Arguments**

CIELMatrix      CIELab or CIELuv data

**Author(s)**

Jose Gama

**Source**

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

**References**

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

**Examples**

```
CIELMatrix<-c(34.78467, 28.15159, 3.024663)
CIE1976hueangle(CIELMatrix)
```

---

CIE1976uv2CIE1931xy      *CIE-1976 u'v' to CIE-1931 xy*

---

**Description**

CIE1976uv2CIE1931xy CIE-1976 u'v' to CIE-1931 xy.

**Usage**

```
CIE1976uv2CIE1931xy(uvmatrix)
```

**Arguments**

uvmatrix      CIE-1976 u'v' data

**Author(s)**

Jose Gama

**Source**

Paul Schils, 2014 Color theory phenomena <http://www.color-theory-phenomena.nl/10.03.htm>



**References**

Paul Schils, 2014 Color theory phenomena <http://www.color-theory-phenomena.nl/10.03.htm>

**Examples**

CIE1976uv2CIE1931xy(c(0.2830965, 0.4661789))

---

CIE1976uv2CIE1960uv    *CIE-1976 u'v' to CIE-1960 uv*

---

**Description**

CIE1976uv2CIE1960uv CIE-1976 u'v' to CIE-1960 uv.

**Usage**

CIE1976uv2CIE1960uv(uvmatrix)

**Arguments**

uvmatrix          CIE-1976 u'v' data

**Author(s)**

Jose Gama

**Source**

Paul Schils, 2014 Color theory phenomena <http://www.color-theory-phenomena.nl/10.03.htm>

**References**

Paul Schils, 2014 Color theory phenomena <http://www.color-theory-phenomena.nl/10.03.htm>

**Examples**

CIE1976uv2CIE1960uv(c(0.2830965, 0.4661789))

---

CIE1976uvSaturation    *CIE 1976 uv Saturation*

---

**Description**

CIE1976uvSaturation CIE 1976 uv Saturation.

**Usage**

```
CIE1976uvSaturation(uvMatrix, whitepoint)
```

**Arguments**

uvMatrix	CIE Luv data
whitepoint	white point

**Author(s)**

Jose Gama

**Source**

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

**References**

R. W. G. Hunt, M. R. Pointer, 2011 Measuring Colour Volume 23 of The Wiley-IS&T Series in Imaging Science and Technology John Wiley & Sons

**Examples**

```
CIE1976uvSaturation(cbind(34.78467, 28.15159, 3.024663), as.numeric(
  get("XYZperfectreflectingdiffuser",
  envir = environment())[which(get("XYZperfectreflectingdiffuser",
  envir = environment())["Illuminant"]=='C'),c('X2','Y2')))
```

---

`CIELabtoDIN99`*Conversion from CIELAB color space to DIN99 coordinates*

---

**Description**

`CIELabtoDIN99` Converts from CIELAB color space to DIN99 coordinates.

**Usage**

`CIELabtoDIN99(Lab)`

**Arguments**

Lab                    CIELAB

**Value**

DIN99

**Author(s)**

Jose Gama

**Source**

CIELAB to DIN99 coordinates, 2014 <https://de.wikipedia.org/w/index.php?title=Diskussion:DIN99-Farbraum>

**References**

CIELAB to DIN99 coordinates, 2014 <https://de.wikipedia.org/w/index.php?title=Diskussion:DIN99-Farbraum>

**Examples**

`CIELabtoDIN99(c(0.310897, 0.306510, 74.613450))`

CIEluminanceY2NCSblackness

*approximated NCS blackness s by the CIE luminance factor Y*

---

**Description**

CIEluminanceY2NCSblackness approximated NCS blackness s by the CIE luminance factor Y.

**Usage**

```
CIEluminanceY2NCSblackness(Y)
```

**Arguments**

Y                    CIE values for illuminant C

**Author(s)**

Jose Gama

**Source**

Hsien-Che Lee, 2005 Introduction to Color Imaging Science Cambridge University Press pp. 366

**References**

Hsien-Che Lee, 2005 Introduction to Color Imaging Science Cambridge University Press pp. 366

**Examples**

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
CIEluminanceY2NCSblackness(xyY[3])
```

---

CIETint

*Tint indices: CIE Tint and ASTM E313 Tint*

---

**Description**

CIETint Tint indices: CIE Tint and ASTM E313 Tint.

**Usage**

```
CIETint(xymatrix,illuminant='D65',observer=2)
```

**Arguments**

xymatrix	matrix with xy data
illuminant	illuminant
observer	observer

**Value**

Tint

**Author(s)**

Jose Gama

**Source**

CIE, 2004 CIE Publication 15:2004, "Colorimetry" ASTM E313, "Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates"

**References**

CIE, 2004 CIE Publication 15:2004, "Colorimetry" ASTM E313, "Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates"

**Examples**

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
CIETint(xyY)
```

---

cixyz31

*CIE 1931 2-deg, XYZ CMFs*

---

**Description**

cixyz31 is a table with CIE 1931 2-deg, XYZ color matching functions.

**Usage**

```
cixyz31
```

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)

**xbar** x CMF

**ybar** y CMF

**zbar** z CMF

**Author(s)**

Jose Gama

**Source**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**References**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**Examples**

```
data(ciexyz31)
ciexyz31
```

---

ciexyz64

*CIE 1964 10-deg, XYZ CMFs*

---

**Description**

ciexyz64 is a table with CIE 1964 10-deg, XYZ color matching functions.

**Usage**

```
ciexyz64
```

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)

**xbar** x CMF

**ybar** y CMF

**zbar** z CMF

**Author(s)**

Jose Gama

**Source**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**References**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**Examples**

```
data(cixyz64)
cixyz64
```

---

CMY2CMYK

*Convert CMY coordinates to CMYK*

---

**Description**

CMY2CMYK Converts CMY coordinates to CMYK.

**Usage**

```
CMY2CMYK(CMYmatrix)
```

**Arguments**

CMYmatrix      CMY coordinates

**Value**

CMYK coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

```
CMY2CMYK(c(0.59072, 0.85570, 0.80283))
```

---

CMY2RGB

*Convert CMYK coordinates to RGB*

---

**Description**

CMY2RGB Converts CMYK coordinates to RGB.

**Usage**

CMY2RGB(CMYmatrix)

**Arguments**

CMYmatrix      CMY coordinates

**Value**

RGB coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

CMY2RGB(c(0.310897, 0.306510, 74.613450))

---

CMYK2CMY

*Convert CMYK coordinates to CMY*

---

**Description**

CMYK2CMY Converts CMYK coordinates to CMY.

**Usage**

CMYK2CMY(CMYKmatrix)



**Arguments**

CMYKmatrix      CMYK coordinates

**Value**

CMY coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

CMYK2CMY(c(.342, .768, .683, .378))

---

ColorBlockFromMunsell *Get HVC, ISCC-NBS Number and ISCC-NBS Name from Munsell notation*

---

**Description**

ColorBlockFromMunsell Get HVC, ISCC-NBS Number and ISCC-NBS Name from Munsell notation.

**Usage**

ColorBlockFromMunsell(HVC)

**Arguments**

HVC                  Munsell hue, value and chroma

**Format**

- HVC[1]** ] Munsell hue, on the ASTM D1535 100 point circular scale. All values are valid.
- HVC[2]** ] Munsell value, must be between 0 and 10
- HVC[3]** ] Munsell chroma, must be non-negative

**Value**

HVC, ISCC-NBS Number, ISCC-NBS Name

**Author(s)**

Glenn Davis

---

compuphaseDifferenceRGB

*compuphase Difference RGB*

---

**Description**

compuphaseDifferenceRGB compuphase Difference RGB.

**Usage**

compuphaseDifferenceRGB(RGB1, RGB2)

**Arguments**

RGB1	RGB color sample
RGB2	RGB color reference

**Value**

Delta E

**Author(s)**

Jose Gama

**Source**

Thiadmer Riemersma, 2012 CompuPhase <https://www.compuphase.com/cmetric.htm>

**References**

Thiadmer Riemersma, 2012 CompuPhase <https://www.compuphase.com/cmetric.htm>

**Examples**

compuphaseDifferenceRGB(c(124,63,78),c(241,65,78))

---

conversionIlluminance *Conversion Factors for Units of Illuminance*

---

**Description**

conversionIlluminance is a table of conversion factors for units of Illuminance

**Usage**

```
conversionIlluminance
```

**Format**

This data frame contains the following columns:

**footcandles** foot-candles

**lux** lm/m<sup>2</sup> = lux

**phot** phot

**milliphot** milliphot

**units** units

**Author(s)**

Jose Gama

**Source**

J. Meyer-Arendt, "Radiometry and Photometry: Units and Conversion Factors," *Appl. Opt.* 7, 2081-2081 (1968).

**References**

J. Meyer-Arendt, "Radiometry and Photometry: Units and Conversion Factors," *Appl. Opt.* 7, 2081-2081 (1968).

**Examples**

```
data(conversionIlluminance)  
conversionIlluminance
```

---

conversionLuminance    *Conversion Factors for Units of Luminance*

---

### Description

conversionLuminance is a table of conversion factors for units of Luminance

### Usage

```
conversionLuminance
```

### Format

This data frame contains the following columns:

**cd.m.2** cd/m<sup>2</sup> = nit

**cd.cm.2** cd/cm<sup>2</sup> = stilb

**cd.ft.2** cd/ft<sup>2</sup>

**cd.in.2** cd/in<sup>2</sup>

**apostilb** apostilb = blondel

**millilambert** millilambert

**footlambert** foot-lambert

### Author(s)

Jose Gama

### Source

J. Meyer-Arendt, "Radiometry and Photometry: Units and Conversion Factors," Appl. Opt. 7, 2081-2081 (1968).

### References

J. Meyer-Arendt, "Radiometry and Photometry: Units and Conversion Factors," Appl. Opt. 7, 2081-2081 (1968).

### Examples

```
data(conversionLuminance)
conversionLuminance
```

---

createIsoTempLinesTable  
*table of isothermperature lines for use with the Robertson Method*

---

### Description

createIsoTempLinesTable table of isothermperature lines for use with the Robertson Method (Robertson, 1968) to interpolate isothermperature lines from the CIE 1960 UCS.

### Usage

```
createIsoTempLinesTable(SPD=NA,CIETable = get("ciexyz31", envir = environment()),  
TCS = get("TCSdata", envir = environment()))
```

### Arguments

SPD	light source spd
CIETable	reference data values
TCS	spectral reflectance data of 14 color test samples for CRI

### Value

Iso temperature lines table

### Author(s)

Jose Gama

### Source

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI <https://www.lrc.rpi.edu/programs/nlpiip/lightinganswers/pdf/print/lightsources.pdf>

### References

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI <https://www.lrc.rpi.edu/programs/nlpiip/lightinganswers/pdf/print/lightsources.pdf>

### Examples

```
# illuminant A  
SPD = illuminants[1:51*2-1,c('wlnm','A')] # every 10 nm  
isoTempLinesTable <- createIsoTempLinesTable(SPD)
```

---

daylightcomponents     *daylight components*

---

### Description

daylightcomponents table with the mean relative spectral radiant power distribution and first two eigenvectors for the CIE method of calculating daylight.

### Format

This data frame contains the following columns:

**wlnm** wavelength in nm

**S0** mean relative spectral radiant power distribution

**S1** first eigenvector

**S2** second eigenvector

### Author(s)

Jose Gama

### Source

Wyszecki, G. and Stiles, W.S., 1982 Color Science: Concepts and Methods, Quantitative data and formulae. John Wiley & Sons.

### References

Wyszecki, G. and Stiles, W.S., 1982 Color Science: Concepts and Methods, Quantitative data and formulae. John Wiley & Sons.

### Examples

```
data(daylightcomponents)
str(daylightcomponents)
```

---

deltaE1976	<i>Delta E (CIE 1976)</i>
------------	---------------------------

---

**Description**

deltaE1976 The color difference Delta E (CIE 1976).

**Usage**

deltaE1976(Lab1, Lab2)

**Arguments**

Lab1	CIE Lab color sample
Lab2	CIE Lab color reference

**Value**

Delta E

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com>

**References**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com>

**Examples**

```
RGB1<-c(124,63,78)
RGB2<-c(95,213,184)
deltaE1976(RGB1,RGB2)
```

---

`deltaE1994`*Delta E (CIE 1994)*

---

**Description**

`deltaE1994` The color difference Delta E (CIE 1994).

**Usage**

```
deltaE1994(Lab1, Lab2, textiles = FALSE)
```

**Arguments**

<code>Lab1</code>	CIE Lab color sample
<code>Lab2</code>	CIE Lab color reference
<code>textiles</code>	boolean, TRUE = version for textiles

**Value**

Delta E

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com>

**References**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com>

**Examples**

```
RGB1<-c(124,63,78)
RGB2<-c(95,213,184)
deltaE1994(RGB1,RGB2)
```



---

deltaE2000	<i>Delta E (CIE 2000)</i>
------------	---------------------------

---

**Description**

deltaE2000 The color difference Delta E (CIE 2000).

**Usage**

deltaE2000(Lab1, Lab2)

**Arguments**

Lab1	CIE Lab color sample
Lab2	CIE Lab color reference

**Value**

Delta E

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com>

**References**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com>

**Examples**

```
RGB1<-c(124,63,78)
RGB2<-c(95,213,184)
deltaE2000(RGB1,RGB2)
```

---

`deltaECMC`*Delta E CMC*

---

**Description**

`deltaECMC` The color difference method of the Color Measurement Committee (the CMC) .

**Usage**

```
deltaECMC(Lab1, Lab2, L, C)
```

**Arguments**

Lab1	CIE Lab color sample
Lab2	CIE Lab color reference
L	parameter L
C	parameter C

**Value**

Delta E

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com>

**References**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com>

**Examples**

```
RGB1<-c(124,63,78)
RGB2<-c(95,213,184)
deltaECMC(RGB1,RGB2)
```

---

DeMarcoPokornySmith2degConeFundamentals1992

*DeMarco, Pokorny & Smith (1992) versions of the Smith-Pokorny 2-deg fundamentals*

---

## Description

DeMarcoPokornySmith2degConeFundamentals1992 DeMarco, Pokorny & Smith (1992) versions of the Smith-Pokorny 2-deg fundamentals based on the CIE Judd-Vos 2-deg CMFs.

## Usage

DeMarcoPokornySmith2degConeFundamentals1992

## Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

## Author(s)

Jose Gama

## Source

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

## References

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

## Examples

```
data(DeMarcoPokornySmith2degConeFundamentals1992)
DeMarcoPokornySmith2degConeFundamentals1992
```

---

DIN6167.YellownessIndex

*CIE Whiteness*

---

### Description

DIN6167.YellownessIndex The CIE Whiteness index is widely used in the industry for D65 for 2 or 10 deg observer.

### Usage

```
DIN6167.YellownessIndex(XYZmatrix, illuminant = "C", observer = 2, RefWhite  
= get("XYZperfectreflectingdiffuser", envir = environment()))
```

### Arguments

XYZmatrix	CIE values for illuminant C
illuminant	illuminant
observer	observer
RefWhite	Reference White

### Author(s)

Jose Gama

### Source

Scandinavian Pulp, paper and board, 2003 Basic equations for optical properties SCAN-G 5:03 Revised 2003

### References

Scandinavian Pulp, paper and board, 2003 Basic equations for optical properties SCAN-G 5:03 Revised 2003

### Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)  
DIN6167.YellownessIndex(XYZ)
```

---

DIN99toCIELab

*Conversion from DIN99 coordinates to CIELAB color space*

---

### **Description**

DIN99toCIELab Conversion from DIN99 coordinates to CIELAB color space.

### **Usage**

DIN99toCIELab(Lab99o)

### **Arguments**

Lab99o          Lab99o coordinates

### **Value**

CIELAB coordinates

### **Author(s)**

Jose Gama

### **Source**

DIN99 coordinates to CIELAB color space <https://de.wikipedia.org/w/index.php?title=Diskussion:DIN99-Farbraum>

### **References**

DIN99 coordinates to CIELAB color space <https://de.wikipedia.org/w/index.php?title=Diskussion:DIN99-Farbraum>

### **Examples**

DIN99toCIELab(c(0.59072, 0.85570, 0.80283))

---

`dkl2dklCart`*converts between spherical and cartesian coordinates for DKL*

---

**Description**

`dkl2dklCart` Converts DKL, from spherical coordinates to cartesian. `dklCart2rgb` Converts DKL, from cartesian to spherical coordinates.

**Usage**

```
dkl2dklCart(dklMatrix)
```

**Arguments**

`dklMatrix`      DKL coordinates

**Value**

DKL coordinates

**Author(s)**

Jose Gama

**Source**

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

**References**

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

**Examples**

```
RGB<-c(124,63,78)
d <- rgb2dklCart(RGB)
dklCart2dkl(d)
dkl2dklCart(c(1.647176, 60.8308, 91.45825))
d
```

---

dkl2rgb	<i>convert RGB to DKL</i>
---------	---------------------------

---

### Description

dkl2rgb Converts DKL, spherical coords coordinates to sRGB. dklCart2rgb Converts DKL, cartesian coords coordinates to sRGB.

### Usage

```
dkl2rgb(dklMatrix, conversionMatrix = NA)
```

### Arguments

dklMatrix	DKL coordinates
conversionMatrix	conversion matrix

### Value

RGB coordinates

### Author(s)

Jose Gama

### Source

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

### References

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

### Examples

```
dklC <- rgb2dklCart(c(54, 75, 121))  
dklCart2dkl(dklC)
```

---

DominantWavelength      *Converts xyY coordinates to wavelength*

---

**Description**

DominantWavelength Converts xyY coordinates to wavelength.

**Usage**

```
DominantWavelength(xyYmatrix, illuminant='D65',observer=2,  
RefWhiteIllum=get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

xyYmatrix	xyY matrix
illuminant	illuminant
observer	observer
RefWhiteIllum	Reference White

**Value**

Dominant Wavelength

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2013 <http://www.brucelindbloom.com/index.html?ColorCalculator.html>

**References**

Bruce Justin Lindbloom, 2013 <http://www.brucelindbloom.com/index.html?ColorCalculator.html>

**Examples**

```
DominantWavelength(c(0.59072, 0.85570, 0.80283))
```



---

`emittanceblackbodyPlanck`*emittance of a black body of temperature  $T$  at a given wavelength*

---

**Description**

`emittanceblackbodyPlanck` emittance of a black body of temperature  $T$  at a given wavelength (in metres).

**Usage**

```
emittanceblackbodyPlanck(wlnm, T)
```

**Arguments**

<code>wlnm</code>	wavelength in nm
<code>T</code>	temperature in Kelvin

**Value**

emittance

**Author(s)**

Jose Gama

**Source**

Planck's radiation law [https://en.wikipedia.org/wiki/Planck%27s\\_law](https://en.wikipedia.org/wiki/Planck%27s_law)

**References**

Planck's radiation law [https://en.wikipedia.org/wiki/Planck%27s\\_law](https://en.wikipedia.org/wiki/Planck%27s_law)

**Examples**

```
emittanceblackbodyPlanck(555,2000)
```

---

footcandle2candela.steradian.sqmeter

*converts foot candle to candela steradian / square meter*

---

## Description

footcandle2candela.steradian.sqmeter converts foot candle to candela steradian / square meter [cd\*sr/m<sup>2</sup>].

## Usage

```
footcandle2candela.steradian.sqmeter(ftcl)
```

## Arguments

ftcl	foot candle
------	-------------

## Value

watts / square centimeter

## Author(s)

Jose Gama

## Source

Translators cafe <https://www.translatorscafe.com/unit-converter/en-US/illumination>

## References

Translators cafe <https://www.translatorscafe.com/unit-converter/en-US/illumination>

## Examples

```
footcandle2candela.steradian.sqmeter(5)
```

---

footcandle2lux      *convert foot candle to Lumens/lux*

---

**Description**

footcandle2lux converts foot candle to Lumens/lux.

**Usage**

```
footcandle2lux(ftcl)
```

**Arguments**

ftcl              foot candle

**Value**

Lumens/lux

**Author(s)**

Jose Gama

**Source**

Translators cafe <https://www.translatorscafe.com/unit-converter/en-US/illumination>

**References**

Translators cafe <https://www.translatorscafe.com/unit-converter/en-US/illumination>

**Examples**

```
footcandle2lux(5)
```

---

footcandle2watt.sqcentimeter  
*converts foot candle to watts / square centimeter*

---

**Description**

footcandle2watt.sqcentimeter converts foot candle to watts / square centimeter [w/cm<sup>2</sup>] (at 555 nm) .

**Usage**

```
footcandle2watt.sqcentimeter(ftcl)
```

**Arguments**

ftcl                    foot candle

**Value**

watts / square centimeter

**Author(s)**

Jose Gama

**Source**

Translators cafe <https://www.translatorscafe.com/unit-converter/en-US/illumination>

**References**

Translators cafe <https://www.translatorscafe.com/unit-converter/en-US/illumination>

**Examples**

footcandle2watt.sqcentimeter(5)

---

GanzGrieser.Tint

*Ganz and Grieser Tint*

---

**Description**

GanzGrieser.Tint Ganz Grieser Tint Method.

**Usage**

GanzGrieser.Tint(xyYmatrix)

**Arguments**

xyYmatrix            CIE xyY values for illuminant C

**Author(s)**

Jose Gama

**Source**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**References**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**Examples**

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
GanzGrieser.Tint(xyY)
```

---

GanzGrieser.Whiteness *Ganz and Grieser Whiteness*

---

**Description**

GanzGrieser.Whiteness Dr. E. Ganz (formerly employee of Ciba AG, Switzerland) and Mr.R. Grieser (formerly employee of J.R.Geigy) developed the Ganz Grieser Whiteness Method.

**Usage**

```
GanzGrieser.Whiteness(xyYmatrix)
```

**Arguments**

xyYmatrix      CIE xyY values for illuminant C

**Author(s)**

Jose Gama

**Source**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**References**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**Examples**

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
GanzGrieser.Whiteness(xyY)
```

---

heuristic.wlnm2RGB     *Approximations from wavelengths to RGB*

---

**Description**

heuristic.wlnm2RGB Approximations from wavelengths to RGB.

**Usage**

```
heuristic.wlnm2RGB(wavelength, Gamma = 0.8, IntensityMax = 1)
```

**Arguments**

wavelength	wavelength data
Gamma	Gamma
IntensityMax	maximum intensity

**Value**

RGB coordinates

**Author(s)**

Jose Gama

**Source**

Dan Bruton's, 2004 <http://www.midnightkite.com/color.html> Earl F. Glynn 2006 Delphi conversion <http://www.efg2.com/Lab/ScienceAndEngineering/Spectra.htm>

**References**

Dan Bruton's, 2004 <http://www.midnightkite.com/color.html> Earl F. Glynn 2006 Delphi conversion <http://www.efg2.com/Lab/ScienceAndEngineering/Spectra.htm>

**Examples**

```
heuristic.wlnm2RGB(555)
```

---

HSL2RGB

*Convert HSL coordinates to RGB*

---

### **Description**

HSL2RGB Converts HSL coordinates to RGB.

### **Usage**

```
HSL2RGB(HSLmatrix)
```

### **Arguments**

HSLmatrix      HSL coordinates

### **Value**

RGB coordinates

### **Author(s)**

Jose Gama

### **Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

### **References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

### **Examples**

```
HSL<-c(0.9590164, 0.3262032, 0.3666667)
HSL2RGB(HSL)
HSL2RGB(rbind(HSL,HSL,HSL,HSL,HSL))
```

---

HSV2RGB

*Convert HSV coordinates to RGB*

---

### **Description**

HSV2RGB Converts HSV coordinates to RGB.

### **Usage**

```
HSV2RGB(HSVmatrix)
```

### **Arguments**

HSVmatrix      HSV coordinates

### **Value**

RGB coordinates

### **Author(s)**

Jose Gama

### **Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

### **References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

### **Examples**

```
HSV<-c(0.9590164, 0.4919355, 0.4862745)
HSV2RGB(HSV)
```



---

Hue.2.RGB

*Convert Hue to RGB*

---

### **Description**

Hue.2.RGB Converts Hue to RGB for HSL conversion.

### **Usage**

Hue.2.RGB(v1, v2, vH)

### **Arguments**

v1	value 1
v2	value 2
vH	value of hue

### **Value**

RGB coordinates

### **Author(s)**

Jose Gama

### **Source**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

### **References**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

### **Examples**

Hue.2.RGB(1, 2, 3)

---

huedegree                    *convert Munsell hue to degree*

---

**Description**

huedegree convert Munsell hue to degree.

**Usage**

huedegree(MunIn)

**Arguments**

MunIn                    Munsell hue color

**Value**

Munsell hue degree

**Author(s)**

Jose Gama

**Source**

Takahiro Onodera, 2010 Color-Model-Munsell-Util <http://annocpan.org/dist/Color-Model-Munsell-Util>

**References**

Takahiro Onodera, 2010 Color-Model-Munsell-Util <http://annocpan.org/dist/Color-Model-Munsell-Util>

**Examples**

huedegree('1P')

---

huedegreemunsell            *Table with Munsell hue degrees*

---

**Description**

huedegreemunsell table with Munsell hue degrees.

**Usage**

huedegreemunsell

**Format**

This data frame contains the following columns:

**HueDegree** hue degree

**HueMunsell** hue in Munsell H

**Author(s)**

Jose Gama

**Source**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

**References**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

**Examples**

```
data(huedegreemunsell)
huedegreemunsell
```

---

Hunter60.WhitenessIndex

*Hunter 60 Whiteness Index*

---

**Description**

Hunter60.WhitenessIndex Hunter 60 Whiteness Index.

**Usage**

```
Hunter60.WhitenessIndex(LabHunterMatrix)
```

**Arguments**

LabHunterMatrix  
 Lab Hunter values for illuminant C

**Author(s)**

Jose Gama

**Source**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**References**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**Examples**

```
HunterLab<-c(28.96756, 2.363884, 0.4821515)
Hunter60.WhitenessIndex(HunterLab)
```

---

HunterLab2XYZ                      *Convert HunterLab coordinates to XYZ*

---

**Description**

HunterLab2XYZ Converts HunterLab coordinates to XYZ.

**Usage**

```
HunterLab2XYZ(HunterLabmatrix, illuminant = "D65", observer = 2,
  RefWhite = get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

HunterLabmatrix	HunterLab coordinates
illuminant	illuminant
observer	observer
RefWhite	Reference White

**Value**

XYZ coordinates

**Author(s)**

Jose Gama

**Source**Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>**References**Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>**Examples**

HunterLab2XYZ(c(0.310897, 0.306510, 74.613450))

---

illuminantA	<i>Relative spectral power distributions of CIE illuminant A at 1 nm interval</i>
-------------	---

---

**Description**

illuminantA is a table with Relative spectral power distributions of CIE illuminant A at 1 nm interval.

**Usage**

illuminantA

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)

**intensity** Relative spectral power

**Author(s)**

Jose Gama

**Source**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**References**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**Examples**

```
data(illuminantA)
illuminantA
```

---

illuminantD65	<i>Relative spectral power distributions of CIE illuminant D65 at 1 nm interval</i>
---------------	---

---

**Description**

illuminantD65 is a table with Relative spectral power distributions of CIE illuminant D65 at 1 nm interval.

**Usage**

```
illuminantD65
```

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)

**intensity** Relative spectral power

**Author(s)**

Jose Gama

**Source**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**References**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**Examples**

```
data(illuminantD65)
illuminantD65
```

---

illuminants	<i>Relative spectral power distributions of CIE illuminants at 5 nm interval</i>
-------------	--

---

**Description**

illuminants is a table with Relative spectral power distributions of CIE illuminants at 5 nm interval.

**Usage**

illuminants

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)

**A** illuminant A

**B** illuminant B

**C** illuminant C

**D50** illuminant D50

**D55** illuminant D55

**D65** illuminant D65

**D75** illuminant D75

**D93** illuminant D93

**E** illuminant E

**Natural** illuminant Natural

**PlusWhite** illuminant PlusWhite

**TL84** illuminant TL84

**Polylux3000** illuminant Polylux3000

**Polylux4000** illuminant Polylux4000

**KolorRite** illuminant KolorRite

**FL1** illuminant FL1

**FL2** illuminant FL2

**FL3** illuminant FL3

**FL4** illuminant FL4

**FL5** illuminant FL5

**FL6** illuminant FL6

**FL7** illuminant FL7

**FL8** illuminant FL8  
**FL9** illuminant FL9  
**FL10** illuminant FL10  
**FL11** illuminant FL11  
**FL12** illuminant FL12

**Author(s)**

Jose Gama

**Source**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**References**

Wyszecki, G., & Stiles, W. S., 1982 Color Science: concepts and methods, quantitative data and formulae (2nd ed.). New York: Wiley.

**Examples**

```
data(illuminants)  
illuminants
```

---

ISObrightnessReflectometerRSD

*Weighting factors for the calculation of ISO brightness*

---

**Description**

ISObrightnessReflectometerRSD is a table with the weighting factors for the calculation of ISO brightness.

**Usage**

```
ISObrightnessReflectometerRSD
```

**Format**

This data frame contains the following data:

**wln** wavelength  
**F** factor  
**weights** weight



**Author(s)**

Jose Gama

**Source**

Scandinavian Pulp, paper and board, 2003 Basic equations for optical properties SCAN-G 5:03 Revised 2003

**References**

Scandinavian Pulp, paper and board, 2003 Basic equations for optical properties SCAN-G 5:03 Revised 2003

**Examples**

```
data(ISObrightnessReflectometerRSD)
ISObrightnessReflectometerRSD
```

---

kelvin2xy	<i>Blackbody radiator color temperature to CIE 1931 x,y chromaticity approximation function</i>
-----------	---

---

**Description**

kelvin2xy Blackbody radiator color temperature to CIE 1931 x,y chromaticity approximation function.

**Usage**

```
kelvin2xy(T)
```

**Arguments**

T                    temperature in Kelvin

**Value**

color temperature

**Author(s)**

Jose Gama

**Source**

Kim et al., 2002 "Design of Advanced Color - Temperature Control System for HDTV Applications" <https://www.jkps.or.kr/journal/view.html?uid=5163&vmd=Full>

**References**

Kim et al., 2002 "Design of Advanced Color - Temperature Control System for HDTV Applications" <https://www.jkps.or.kr/journal/view.html?uid=5163&vmd=Full>

**Examples**

```
kelvin2xy(300)
```

---

Lab2LCHab

*Convert CIE Lab coordinates to LCHab*

---

**Description**

Lab2LCHab Converts CIE Lab coordinates to LCHab.

**Usage**

```
Lab2LCHab(LabMatrix)
```

**Arguments**

LabMatrix      CIE Lab coordinates

**Value**

LCHab coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

```
Lab2LCHab(c(0.310897, 0.306510, 74.613450))
```

---

**LAB2LUV***Convert CIE Lab coordinates to CIE Luv*

---

**Description**

LAB2LUV Converts CIE Lab coordinates to CIE Luv.

**Usage**

```
LAB2LUV(Labmatrix)
```

**Arguments**

Labmatrix      CIE Lab coordinates

**Value**

XYZ coordinates

**Author(s)**

Jose Gama

**Examples**

```
LAB2LUV(c(0.310897, 0.306510, 74.613450))
```

---

**Lab2XYZ***Convert CIE Lab coordinates to XYZ*

---

**Description**

Lab2XYZ Converts CIE Lab coordinates to XYZ.

**Usage**

```
Lab2XYZ(Labmatrix, illuminant = "D65", observer = 2, RefWhite  
        = get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

Labmatrix      CIE Lab coordinates  
illuminant      illuminant  
observer        observer  
RefWhite        Reference White

**Value**

XYZ coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

Lab2XYZ(c(0.310897, 0.306510, 74.613450))

---

LCHab2Lab

*Convert LCHab coordinates to CIE Lab*

---

**Description**

LCHab2Lab Converts LCHab coordinates to CIE Lab.

**Usage**

LCHab2Lab(LCHabmatrix)

**Arguments**

LCHabmatrix    LCHab coordinates

**Value**

CIE Lab coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

```
LCHab2Lab(c(0.310897, 0.306510, 74.613450))
```

---

LCHuv2Luv

*Convert LCHuv coordinates to CIE Luv*

---

**Description**

LCHuv2Luv Converts LCHuv coordinates to CIE Luv.

**Usage**

```
LCHuv2Luv(LCHuvmatrix)
```

**Arguments**

LCHuvmatrix    LCHuv coordinates

**Value**

CIE Luv coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

```
LCHuv2Luv(c(0.310897, 0.306510, 74.613450))
```

---

`LEF2RGB`*Convert LEF coordinates to RGB*

---

**Description**

LEF2RGB Converts LEF coordinates to RGB.

**Usage**

```
LEF2RGB(LEFmatrix)
```

**Arguments**

LEFmatrix      LEF coordinates

**Value**

RGB coordinates

**Author(s)**

Jose Gama

**Source**

Kang, Henry R, 2006 Computational color technology Spie Press Bellingham

**References**

Kang, Henry R, 2006 Computational color technology Spie Press Bellingham

**Examples**

```
LEF<-c(176.66667, 53.50000, -12.99038)
LEF2RGB(LEF)
```

---

LMS2DKL

*Convert LMS coordinates to DKL*

---

**Description**

LMS2DKL Converts LMS coordinates to DKL.

**Usage**

LMS2DKL(bg, diffcone.coords, DKL2LMS = FALSE)

**Arguments**

bg	LMS coordinates
diffcone.coords	LMS coordinates
DKL2LMS	boolean, FALSE = DKL to LMS, TRUE = LMS to DKL

**Value**

DKL coordinates

**Author(s)**

Jose Gama

**Source**

David H. Brainard Cone Contrast and Opponent Modulation Color Spaces pp. 563 PART IV: CONE CONTRAST AND OPPONENT MODULATION COLOR SPACES

**References**

David H. Brainard Cone Contrast and Opponent Modulation Color Spaces pp. 563 PART IV: CONE CONTRAST AND OPPONENT MODULATION COLOR SPACES

**Examples**

```
#LMS<-c(3.822394, 10.17498, 1.130049)
#LMS2DKL(LMS)
```

---

LMS2RGB

*Convert LMS coordinates to RGB*

---

**Description**

LMS2RGB Converts LMS coordinates to RGB.

**Usage**

LMS2RGB(LMSmatrix)

**Arguments**

LMSmatrix      LMS coordinates

**Value**

RGB coordinates

**Author(s)**

Jose Gama

**Source**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**References**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**Examples**

```
LMS<-c(3.822394, 10.17498, 1.130049)
LMS2RGB(LMS)
```



---

LMS2XYZ

*Convert LMS coordinates to XYZ*

---

**Description**

LMS2XYZ Converts LMS coordinates to XYZ.

**Usage**

LMS2XYZ(LMSmatrix)

**Arguments**

LMSmatrix      LMS coordinates

**Value**

XYZ coordinates

**Author(s)**

Jose Gama

**Source**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**References**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**Examples**

```
LMS<-c(3.822394, 10.17498, 1.130049)
LMS2XYZ(LMS)
```

---

LSLM2RGB

*Convert LSLM coordinates to RGB*

---

**Description**

LSLM2RGB Converts LSLM coordinates to RGB.

**Usage**

LSLM2RGB(LSLMmatrix)

**Arguments**

LSLMmatrix      LSLM coordinates

**Value**

RGB coordinates

**Author(s)**

Jose Gama

**Source**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**References**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**Examples**

```
LSLM<-c(-0.4186083, 0.007563981, 0.4918533)
LSLM2RGB(LSLM)
```

---

LUV2LAB                      *Convert CIE Luv coordinates to CIE Lab*

---

**Description**

LUV2LAB Converts CIE Luv coordinates to CIE Lab.

**Usage**

LUV2LAB(Luvmatrix)

**Arguments**

Luvmatrix              Luv matrix

**Value**

XYZ coordinates

**Author(s)**

Jose Gama

**Examples**

LUV2LAB(c(0.310897, 0.306510, 74.613450))

---

Luv2LCHuv                      *Convert CIE Luv coordinates to LCHuv*

---

**Description**

Luv2LCHuv Converts CIE Luv coordinates to LCHuv.

**Usage**

Luv2LCHuv(LuvMatrix)

**Arguments**

LuvMatrix              Luv coordinates

**Value**

LCHuv coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

```
Luv2LCHuv(c(0.310897, 0.306510, 74.613450))
```

---

Luv2XYZ

*Convert CIE Luv coordinates to XYZ*

---

**Description**

Luv2XYZ Converts CIE Luv coordinates to XYZ.

**Usage**

```
Luv2XYZ(Luvmatrix, illuminant = "D65", observer = 2, RefWhite  
        = get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

Luvmatrix	Luv matrix
illuminant	illuminant
observer	observer
RefWhite	Reference White

**Value**

XYZ coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

```
Luv2XYZ(c(0.310897, 0.306510, 74.613450))
```

---

Luv2Yuv

*Convert CIE Luv coordinates to Yuv*

---

**Description**

Luv2Yuv Converts CIE Luv coordinates to Yuv.

**Usage**

```
Luv2Yuv(Luvmatrix, illuminant='D65', observer=2, RefWhite=  
get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

Luvmatrix	CIE Luv coordinates
illuminant	illuminant
observer	observer
RefWhite	Reference White

**Value**

Yuv coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

```
Luv2Yuv(c(0.310897, 0.306510, 74.613450))
```

---

makeChromaticAdaptationMatrix  
*Generate a Chromatic Adaptation matrix*

---

**Description**

makeChromaticAdaptationMatrix Generates a Chromatic Adaptation matrix.

**Usage**

```
makeChromaticAdaptationMatrix(ChromaticAdaptationAlgorithm = "VonKries",  
                               illuminantSource = "C", illuminantDestination = "D65",  
                               observer = 2, ChromaticAdaptationArray =  
                               get("ChromaticAdaptation", envir = environment()),  
                               referenceWhiteArray = get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

ChromaticAdaptationAlgorithm	Chromatic adaptation algorithm
illuminantSource	illuminant source
illuminantDestination	illuminant destination
observer	observer
ChromaticAdaptationArray	Chromatic adaptation array
referenceWhiteArray	reference white

**Value**

Chromatic Adaptation matrix

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

---

MaterialReferenceData *Material Reference Data from Principles of Digital Image Synthesis*

---

**Description**

MaterialReferenceData Material Reference Data from Principles of Digital Image Synthesis, Appendix G Andrew S. Glassner 16 August 1994.

**Usage**

MaterialReferenceData

**Format**

This data frame contains the following data:

**wavelength** wavelength (nm)  
**DarkSkin** spectra of: dark skin  
**LightSkin** spectra of: light skin  
**BlueSky** spectra of: blue sky  
**Foliage** spectra of: foliage  
**BlueFlower** spectra of: blue flower  
**BluishGreen** spectra of: bluish green  
**Orange** spectra of: orange  
**PurplishBlue** spectra of: purplish blue  
**ModerateRed** spectra of: moderate red  
**Purple** spectra of: purple  
**YellowGreen** spectra of: yellow green  
**OrangeYellow** spectra of: orange yellow  
**Blue** spectra of: blue  
**Green** spectra of: green  
**Red** spectra of: red  
**Yellow** spectra of: yellow  
**Magenta** spectra of: magenta  
**Cyan** spectra of: cyan  
**White** spectra of: white  
**Neutral** spectra of: neutral  
**Neutral6.5** spectra of: neutral 6.5  
**Neutral5** spectra of: neutral 5  
**Neutral3.5** spectra of: neutral 3.5

**Black** spectra of: black  
**PineNeedles** spectra of: pine needles  
**SilverMapleLeaf** spectra of: silver maple leaf  
**DarkGreenMapleLeaf** spectra of: dark green maple leaf  
**RedMapleLeaf** spectra of: red maple leaf  
**Grass** spectra of: grass  
**Soil** spectra of: soil  
**VineLeaf** spectra of: vine leaf  
**Alphalt** spectra of: alphalt  
**DaisyWhitePetals** spectra of: daisy white petals  
**DaisyYellowCenter** spectra of: daisy yellow center  
**MarigoldOrange** spectra of: marigold orange  
**MarigoldYellow** spectra of: marigold yellow  
**DarkBlueJeans** spectra of: dark blue jeans  
**FadedJeans** spectra of: faded jeans  
**DarkBlueSweatPants** spectra of: dark blue sweat pants  
**Denim** spectra of: denim  
**WheatBread** spectra of: wheat bread  
**WheatBreadCrust** spectra of: wheat bread crust  
**Pancake** spectra of: pancake  
**SwissArmyKnife** spectra of: swiss army knife  
**PineWood** spectra of: pine wood  
**MapleWood** spectra of: maple wood  
**OakWood** spectra of: oak wood  
**Bamboo** spectra of: bamboo  
**Redwood** spectra of: redwood  
**WalnutWood** spectra of: walnut wood  
**YellowBanana** spectra of: yellow banana  
**RipeBrownBanana** spectra of: ripe brown banana  
**Cucumber** spectra of: cucumber  
**CornKernel** spectra of: corn kernel  
**CornHusk** spectra of: corn husk  
**YellowDeliciousApple** spectra of: yellow delicious apple  
**GreenPepper** spectra of: green pepper  
**LemonSkin** spectra of: lemon skin  
**Lettuce** spectra of: lettuce  
**Carrot** spectra of: carrot  
**BarleySeeds** spectra of: barley seeds  
**LentilSeeds** spectra of: lentil seeds  
**BrownRiceSeeds** spectra of: brown rice seeds  
**Sand** spectra of: sand



**Author(s)**

Jose Gama

**Source**

Andrew S. Glassner, 1995 Principles of Digital Image Synthesis The Morgan Kaufmann Series in Computer Graphics and Geometric Modeling

**References**

Andrew S. Glassner, 1995 Principles of Digital Image Synthesis The Morgan Kaufmann Series in Computer Graphics and Geometric Modeling

**Examples**

```
data(MaterialReferenceData)  
str(MaterialReferenceData)
```

---

MaxChromaFromExtrapRenotationData

*Table with maximum chroma for which extrapolated renotation data is available*

---

**Description**

MaxChromaFromExtrapRenotationData table with maximum chroma for which extrapolated renotation data is available.

**Usage**

```
MaxChromaFromExtrapRenotationData
```

**Format**

This data frame contains the following columns:

**H** Hue

**V** Value

**MaximumChroma** Maximum Chroma

**Author(s)**

Jose Gama

**Source**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

**References**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

**Examples**

```
data(MaxChromaFromExtrapRenotationData)
MaxChromaFromExtrapRenotationData
```

---

MaxChromasForStandardMunsellHuesAndValues

*Table with maximum Munsell chroma, for a given Munsell hue and value, for which an extrapolated renotation value is available*

---

**Description**

MaxChromasForStandardMunsellHuesAndValues table with maximum Munsell chroma, for a given Munsell hue and value, for which an extrapolated renotation value is available.

**Usage**

```
MaxChromasForStandardMunsellHuesAndValues
```

**Format**

This data frame contains the following columns:

**H** Hue

**V** Value

**MaximumChroma** Maximum Chroma (MacAdam limit)

**Author(s)**

Jose Gama

**Source**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

**References**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

**Examples**

```
data(MaxChromasForStandardMunsellHuesAndValues)
MaxChromasForStandardMunsellHuesAndValues
```

---

<code>Maxwell.triangle</code>	<i>Plot the Maxwell triangle</i>
-------------------------------	----------------------------------

---

**Description**

`Maxwell.triangle` Plots the Maxwell triangle, as a black line, a color line or a polygon.

**Usage**

```
Maxwell.triangle(primariesRGB=get("whitepointsRGB", envir = environment()),
conversionFunction=NULL,...)
```

**Arguments**

<code>primariesRGB</code>	primarie valuess for RGB color spaces
<code>conversionFunction</code>	optional function to perform the coordinate conversion
<code>...</code>	optional parameters for the plot command

**Value**

none

**Author(s)**

Jose Gama

**Examples**

```
Maxwell.triangle()
xl<-yl<-0:1
Maxwell.triangle(xlim=xl,ylim=yl)
Maxwell.triangle(conversionFunction=CIE1931XYZ2CIE1976uv,
xlim=xl,ylim=yl,xlab="u'",ylab="v'")
```

Munsell100hues55

*Chromaticity diagram showing values for x and y for Illuminant A for 100 hues at 5/5*

**Description**

Munsell100hues55 Chromaticity diagram showing Tristimulus Values and Trilinear Coordinates for Illuminant A for 100 hues at 5/5.

**Usage**

Munsell100hues55

**Format**

This data frame contains the following columns:

**BookNotation** Munsell color notation from the Munsell book

**MunsellProductionNo**

**X** Tristimulus Value X

**Y** Tristimulus Value Y

**Z** Tristimulus Value Z

**x** Trilinear Coordinate x

**y** Trilinear Coordinate y

**z** Trilinear Coordinate z

**Author(s)**

Jose Gama

**Source**

Hermann VON Schelling, Dean Farnsworth, 1949 Trichromatic Specifications of the Munsell 100 Hues at 5/5 for Illuminant a Defense Technical Information Center NAVAL MEDICAL RESEARCH LAB NEW LONDON CONN.

**References**

Hermann VON Schelling, Dean Farnsworth, 1949 Trichromatic Specifications of the Munsell 100 Hues at 5/5 for Illuminant a Defense Technical Information Center NAVAL MEDICAL RESEARCH LAB NEW LONDON CONN.

**Examples**

```
data(Munsell1100hues55)
Munsell1100hues55
```

---

Munsell1100hues55FM100 *Munsell 100-Hues at 5/5, production numbers 101 to 200 and Farnsworth-Munsell 100 Hue test*

---

**Description**

Munsell1100hues55FM100 Munsell 100-Hues at 5/5, production numbers 101 to 200 and Farnsworth-Munsell 100 Hue test.

**Usage**

```
Munsell1100hues55FM100
```

**Format**

This data frame contains the following columns:

**FMtest** Farnsworth-Munsell 100 Hue test value

**MunsellNumber** Munsell 100-Hues at 5/5, production number

**Author(s)**

Jose Gama

**Source**

Hermann VON Schelling, Dean Farnsworth, 1949 Trichromatic Specifications of the Munsell 100 Hues at 5/5 for Illuminant a Defense Technical Information Center NAVAL MEDICAL RESEARCH LAB NEW LONDON CONN.

**References**

Hermann VON Schelling, Dean Farnsworth, 1949 Trichromatic Specifications of the Munsell 100 Hues at 5/5 for Illuminant a Defense Technical Information Center NAVAL MEDICAL RESEARCH LAB NEW LONDON CONN.

**Examples**

```
data(Munsell100hues55FM100)
Munsell100hues55FM100
```

---

MunsellHues	<i>Table with Munsell Hues</i>
-------------	--------------------------------

---

**Description**

MunsellHues table with Munsell Hues.

**Usage**

```
MunsellHues
```

**Author(s)**

Jose Gama

**Source**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

**References**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

**Examples**

```
data(MunsellHues)
MunsellHues
```

---

MunsellNeutrals2sRGB *Table with Munsell Neutrals and corresponding sRGB*

---

**Description**

MunsellNeutrals2sRGB table with Munsell Neutrals and corresponding sRGB.

**Usage**

MunsellNeutrals2sRGB

**Format**

This data frame contains the following columns:

**MunsellNeutral** Munsell N

**R** sRGB R

**G** sRGB G

**B** sRGB B

**Author(s)**

Jose Gama

**Source**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

**References**

Paul Centore 2014 The Munsell and Kubelka-Munk Toolbox <https://www.munsellcolourscienceforpainters.com/MunsellAndKubelkaMunkToolbox/MunsellAndKubelkaMunkToolbox.html>

James D. Foley, Andries van Dam, Steven K. Feiner, & John F. Hughes, 1990 Computer Graphics: Principles and Practice, 2nd ed., Addison-Wesley Publishing Company.

Gunter Wyszecki & W. S. Stiles, 1982 Color Science: Concepts and Methods, Quantitative Data and Formulae, 2nd edition, John Wiley and Sons

**Examples**

```
data(MunsellNeutrals2sRGB)
MunsellNeutrals2sRGB
```





**References**

Spectral Color Research group, 1989 University of Kuopio, Finland School of Computing and the Department of Physics and Mathematics Database - Munsell Colors Matt (AOTF) <https://sites.uef.fi/spectral/databases-software/munsell-colors-matt-aotf-measured/>

Parkkinen, J. P. S., Hallikainen, J. and Jaaskelainen, 1989 "Characteristic spectra of Munsell colors," Journal of the Optical Society of America Vol. 6, No. 2, February 1989, pp. 318-322.

**Examples**

```
## Not run:  
data(MunsellSpectral)  
MunsellSpectral  
  
## End(Not run)
```

---

MunsellV2relativeLuminanceY

*Munsell value V to relative luminance Y*

---

**Description**

MunsellV2relativeLuminanceY Munsell value V to relative luminance Y.

**Usage**

```
MunsellV2relativeLuminanceY(V)
```

**Arguments**

V Munsell value

**Value**

CIE XYZ "Y"

**Author(s)**

Jose Gama

**Source**

Mark D. Fairchild, 2013 Color Appearance Models, 3rd Ed. Wiley-IS&T

**References**

Mark D. Fairchild, 2013 Color Appearance Models, 3rd Ed. Wiley-IS&T

**Examples**

MunsellV2relativeLuminanceY(5)

---

MunsellV2Y

*Munsell value to CIE XYZ "Y"*

---

**Description**

MunsellV2Y Munsell value to CIE XYZ "Y" .

**Usage**

MunsellV2Y(V)

**Arguments**

V                    Munsell value

**Value**

CIE XYZ "Y"

**Author(s)**

Jose Gama

**Source**

ASTM, 2008 ASTM Standard D1535-08

**References**

ASTM, 2008 ASTM Standard D1535-08

**Examples**

MunsellV2Y(5)

---

NickersonColorDifference

*Nickerson Color Difference*

---

### **Description**

NickersonColorDifference Nickerson's Color Difference.

### **Usage**

NickersonColorDifference(MunsellHVC1, MunsellHVC2)

### **Arguments**

MunsellHVC1      Munsell HVC 1

MunsellHVC2      Munsell HVC 2

### **Value**

Delta E

### **Author(s)**

Jose Gama

### **Source**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com>

### **References**

Bruce Justin Lindbloom, 2013 Color Calculator <http://www.brucelindbloom.com>

### **Examples**

NickersonColorDifference('10B 5/6', '5B 5/4')

---

PhotoYCC2RGB

*Convert PhotoYCC to RGB*

---

### **Description**

PhotoYCC2RGB Converts PhotoYCC to RGB.

### **Usage**

PhotoYCC2RGB(PhotoYCCmatrix)

### **Arguments**

PhotoYCCmatrix PhotoYCC coordinates

### **Value**

RGB coordinates

### **Author(s)**

Jose Gama

### **Source**

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

### **References**

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

### **Examples**

```
p <- c(0.4560569, 155.9415709, 137.3026467)
PhotoYCC2RGB(p)
```

---

PreucilAngle	<i>Preucil Angle</i>
--------------	----------------------

---

**Description**

PreucilAngle Preucil Angle.

**Usage**

PreucilAngle(RGBmatrix)

**Arguments**

RGBmatrix      RGB coordinates

**Value**

Angle

**Author(s)**

Jose Gama

**Source**

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

**References**

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

**Examples**

PreucilAngle(c(24,72,44))

---

PreucilPercentGreyness	<i>Preucil Percentage of Greyness</i>
------------------------	---------------------------------------

---

**Description**

PreucilPercentGreyness Preucil Percentage of Greyness.

**Usage**

PreucilPercentGreyness( RGBmatrix)

**Arguments**

RGBmatrix      RGB coordinates

**Value**

Percentage of Greyness

**Author(s)**

Jose Gama

**Source**

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

**References**

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

**Examples**

```
PreucilPercentGreyness(c(24, 72, 44))
```

---

PreucilPercentHueError

*Preucil Percentage of Greyness*

---

**Description**

PreucilPercentHueError Preucil Percentage of Hue Error.

**Usage**

```
PreucilPercentHueError(RGBmatrix)
```

**Arguments**

RGBmatrix      RGB coordinates

**Value**

Percentage of HueError

**Author(s)**

Jose Gama

**Source**

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

**References**

Robert William Gainer Hunt, 1987 The Reproduction of Colour Fountain Press Edition 4, illustrated

**Examples**

```
PreucilPercentHueError(c(24,72,44))
```

---

RGB2CMY

*Convert sRGB coordinates to CMY*

---

**Description**

RGB2CMY Converts sRGB coordinates to CMY.

**Usage**

```
RGB2CMY(GBmatrix)
```

**Arguments**

GBmatrix      sRGB coordinates

**Value**

CMY coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

```
RGB2CMY(c(0.310897, 0.306510, 74.613450))
```

---

rgb2dklV	<i>convert RGB to DKL</i>
----------	---------------------------

---

**Description**

rgb2dklV Converts sRGB coordinates to DKL, spherical coords, same as Graph-Based Visual Saliency. rgb2dklCart Converts sRGB coordinates to DKL, cartesian coords.

**Usage**

```
rgb2dklV( RGB )
```

**Arguments**

RGB	sRGB coordinates
-----	------------------

**Value**

DKL coordinates

**Author(s)**

Jose Gama

**Source**

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

**References**

Package psychopy for Python

Graph-Based Visual Saliency (MATLAB source code) Jonathan Harel California Institute of Technology

**Examples**

```
rgb2dklCart(c(54, 75, 121))
```



---

`RGB2HSL`*Convert RGB coordinates to HSL*

---

**Description**

RGB2HSL Converts RGB coordinates to HSL.

**Usage**

```
RGB2HSL( RGBmatrix )
```

**Arguments**

`RGBmatrix`      RGB coordinates

**Value**

HSL coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

```
RGB<-c(124,63,78)
RGB2HSL(RGB)
```

---

RGB2HSV

*Convert RGB coordinates to HSV*

---

### **Description**

RGB2HSV Converts RGB coordinates to HSV.

### **Usage**

```
RGB2HSV( RGBmatrix )
```

### **Arguments**

RGBmatrix      RGB coordinates

### **Value**

HSV coordinates

### **Author(s)**

Jose Gama

### **Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

### **References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

### **Examples**

```
RGB<-c(124,63,78)
RGB2HSV(RGB)
```

---

RGB2hue	<i>Convert sRGB coordinates to hue</i>
---------	--

---

**Description**

RGB2hue Converts sRGB coordinates to hue.

**Usage**

```
RGB2hue(GBmatrix)
```

**Arguments**

GBmatrix      sRGB coordinates

**Value**

hue

**Author(s)**

Jose Gama

**Examples**

```
RGB2hue(c(0.310897, 0.306510, 74.613450))
```

---

RGB2LEF	<i>Convert RGB coordinates to LEF</i>
---------	---------------------------------------

---

**Description**

RGB2LEF Converts RGB coordinates to LEF.

**Usage**

```
RGB2LEF(GBmatrix)
```

**Arguments**

GBmatrix      RGB coordinates

**Value**

LEF coordinates

**Author(s)**

Jose Gama

**Source**

Kang, Henry R, 2006 Computational color technology Spie Press Bellingham

**References**

Kang, Henry R, 2006 Computational color technology Spie Press Bellingham

**Examples**

```
RGB<-c(124,63,78)
RGB2LEF(RGB)
```

---

RGB2LMS

*Convert RGB coordinates to LMS*

---

**Description**

RGB2LMS Converts RGB coordinates to LMS.

**Usage**

```
RGB2LMS(RGBmatrix)
```

**Arguments**

RGBmatrix      RGB coordinates

**Value**

LMS coordinates

**Author(s)**

Jose Gama

**Source**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**References**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**Examples**

```
RGB<-c(124,63,78)
RGB2LMS(RGB)
```

---

**RGB2LSLM***Convert RGB coordinates to LSLM*

---

**Description**

RGB2LSLM Converts RGB coordinates to LSLM.

**Usage**

```
RGB2LSLM(RGBmatrix)
```

**Arguments**

RGBmatrix      RGB coordinates

**Value**

LSLM coordinates

**Author(s)**

Jose Gama

**Source**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**References**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**Examples**

```
RGB<-c(124,63,78)
RGB2LSLM(RGB)
```

---

`RGB2PhotoYCC`*Convert RGB coordinates to PhotoYCC*

---

**Description**

RGB2PhotoYCC Converts RGB coordinates to PhotoYCC.

**Usage**

```
RGB2PhotoYCC(RGBmatrix)
```

**Arguments**

`RGBmatrix`      RGB coordinates

**Value**

PhotoYCC coordinates

**Author(s)**

Jose Gama

**Source**

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

**References**

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

**Examples**

```
RGB<-c(124, 63, 78)
RGB2PhotoYCC(RGB)
```

---

 RGB2XYZ

 Convert sRGB coordinates to XYZ
 

---

**Description**

RGB2XYZ Converts sRGB coordinates to XYZ.

**Usage**

```
RGB2XYZ(GBmatrix, illuminant = "D65", observer = 2, RefWhite
        = get("XYZperfectreflectingdiffuser", envir = environment()),
        RGBModel = "sRGB", RefWhiteRGB = get("whitepointsRGB",
        envir =environment()), gamma = NA,
        RefWhiteIllum = get("XYZperfectreflectingdiffuser",
        envir = environment()), CAT = "Bradford",
        CATarray = get("ChromaticAdaptation", envir = environment()))
```

**Arguments**

GBmatrix	sRGB coordinates
illuminant	illuminant
observer	observer
RefWhite	White Reference
RGBModel	RGB Model
RefWhiteRGB	White Reference RGB
gamma	gamma
RefWhiteIllum	White Reference illuminant
CAT	Chromatic Adaptation algorithm
CATarray	Chromatic Adaptation data

**Value**

CIE XYZ coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

```
RGB2XYZ(c(0.310897, 0.306510, 74.613450))
```

---

RGB2YCbCr

*Convert RGB coordinates to YCbCr*

---

**Description**

RGB2YCbCr Converts RGB coordinates to YCbCr.

**Usage**

```
RGB2YCbCr(RGBmatrix)
```

**Arguments**

RGBmatrix      RGB coordinates

**Value**

YCbCr coordinates

**Author(s)**

Jose Gama

**Source**

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

**References**

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

**Examples**

```
RGB<-c(124,63,78)
RGB2YCbCr(RGB)
```



---

`RGB2YIQ`*Convert RGB coordinates to YIQ*

---

**Description**

RGB2YIQ Converts RGB coordinates to YIQ.

**Usage**

```
RGB2YIQ(RGBmatrix)
```

**Arguments**

RGBmatrix      RGB coordinates

**Value**

YIQ coordinates

**Author(s)**

Jose Gama

**Source**

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

**References**

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

**Examples**

```
RGB<-c(124,63,78)
RGB2YIQ(RGB)
```

---

RGB2YPbPr

*Convert RGB coordinates to YPbPr*

---

### Description

RGB2YPbPr Converts RGB coordinates to YPbPr.

### Usage

RGB2YPbPr(GBmatrix)

### Arguments

GBmatrix      RGB coordinates

### Value

YPbPr coordinates

### Author(s)

Jose Gama

### Source

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

### References

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

### Examples

```
RGB<-c(124, 63, 78)
RGB2YPbPr(RGB)
```

---

RGB2YUV	<i>Convert RGB coordinates to YUV</i>
---------	---------------------------------------

---

**Description**

RGB2YUV Converts RGB coordinates to YUV.

**Usage**

```
RGB2YUV(GBmatrix)
```

**Arguments**

GBmatrix	RGB coordinates
----------	-----------------

**Value**

YUV coordinates

**Author(s)**

Jose Gama

**Examples**

```
RGB<-c(124,63,78)
RGB2YUV(RGB)
```

---

RxRyRz2XYZ	<i>convert from three filter measurements (reflectance factors) to XYZ</i>
------------	--

---

**Description**

RxRyRz2XYZ convert from three filter measurements (reflectance factors) to XYZ.

**Usage**

```
RxRyRz2XYZ(RxRyRzmatrix=NA,illuminant='C', observer=2,
RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

RxRyRzmatrix	reflectance factors coordinates
illuminant	illuminant
observer	observer
RefWhite	White Reference

**Value**

CIE XYZ coordinates

**Author(s)**

Jose Gama

**Examples**

RxRyRz2XYZ(c(7.90393, 8.391198, 9.721126))

---

saturationCIECAM02      *saturation CIECAM 2002*

---

**Description**

saturationCIECAM02 saturation CIECAM 2002.

**Usage**

saturationCIECAM02(M, Q)

**Arguments**

M	colorfulness
Q	brightness

**Value**

saturation

**Author(s)**

Jose Gama

**Source**

Color by Wikipedians <http://www.easyrgb.com/>

**References**

Color by Wikipedians <http://www.easyrgb.com/>

---

saturationCIELABEvaLubbe

*CIELAB saturation (Eva Lubbe)*

---

### **Description**

saturationCIELABEvaLubbe CIELAB saturation (chroma normalized by lightness).

### **Usage**

saturationCIELABEvaLubbe(L, a, b)

### **Arguments**

L	CIELAB L
a	CIELAB a
b	CIELAB b

### **Value**

saturation

### **Author(s)**

Jose Gama

### **Source**

Color by Wikipedians <http://www.easyrgb.com/>

### **References**

Color by Wikipedians <http://www.easyrgb.com/>

### **Examples**

saturationCIELABEvaLubbe(34.78467, 28.15159, 3.024663)

---

saturationCIELUV      *CIELUV/CIELAB saturation*

---

**Description**

saturationCIELUV CIELUV/CIELAB saturation.

**Usage**

saturationCIELUV(u, v, un, vn)

**Arguments**

u	CIELAB u
v	CIELAB v
un	CIELAB u neutral
vn	CIELAB v neutral

**Value**

saturation

**Author(s)**

Jose Gama

**Source**

Color by Wikipedians <http://www.easyrgb.com/>

**References**

Color by Wikipedians <http://www.easyrgb.com/>

---

SmithPokorny2degConeFundamentals1975

*Smith & Pokorny (1975) 2-deg cone fundamentals*

---

**Description**

SmithPokorny2degConeFundamentals1975 Smith & Pokorny (1975) 2-deg cone fundamentals based on the CIE Judd-Vos 2-deg CMFs.

**Usage**

SmithPokorny2degConeFundamentals1975

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

**Author(s)**

Jose Gama

**Source**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

**References**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

**Examples**

```
data(SmithPokorny2degConeFundamentals1975)
SmithPokorny2degConeFundamentals1975
```

---

spectra2CCT

*Correlated Color Temperature (CCT) from spectra*

---

**Description**

spectra2CCT Correlated Color Temperature (CCT) from spectra.

**Usage**

```
spectra2CCT(SPD=NA, isoTempLinesTable=NA,
CIETable = get("ciexyz31", envir = environment()), TCS = get("TCSdata",
envir = environment()))
```

**Arguments**

SPD light source spd

isoTempLinesTable

Iso temperature lines table

CIETable reference data values

TCS spectral reflectance data of 14 color test samples for CRI

**Value**

Correlated Color Temperature (CCT)

**Author(s)**

Jose Gama

**Source**

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI <https://www.lrc.rpi.edu/programs/nlpip/lightinganswers/pdf/print/lightsources.pdf>

**References**

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI <https://www.lrc.rpi.edu/programs/nlpip/lightinganswers/pdf/print/lightsources.pdf>

**Examples**

```
# illuminant A
SPD = illuminants[1:51*2-1,c('wlnm','A')] # every 10 nm
CCT <- spectra2CCT(SPD)
CCT
```

---

spectra2CRIGAI FSCI      *CRI, GAI and FSCI from spectra*

---

**Description**

spectra2CRIGAI FSCI Color Rendering Index (CRI), Gamut Area Index (GAI) and full spectrum index (FSI) from spectra.

**Usage**

```
spectra2CRIGAI FSCI(SPD=NA, isoTempLinesTable=NA, CCT=NA,
CIETable = get("ciexyz31", envir = environment()), TCS = get("TCSdata",
envir = environment()))
```

**Arguments**

SPD	light source spd
isoTempLinesTable	Iso temperature lines table
CCT	Correlated Color Temperature (CCT)
CIETable	reference data values
TCS	spectral reflectance data of 14 color test samples for CRI



**Value**

CRI, GAI and FSCI

**Author(s)**

Jose Gama

**Source**

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI <https://www.lrc.rpi.edu/programs/nlpip/lightinganswers/pdf/print/lightsources.pdf>

**References**

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI <https://www.lrc.rpi.edu/programs/nlpip/lightinganswers/pdf/print/lightsources.pdf>

**Examples**

```
# illuminant A
## Not run:
SPD = illuminants[1:51*2-1,c('wlnm','A')] # every 10 nm
isoTempLinesTable <- createIsoTempLinesTable(SPD)
CCT <- spectra2CCT(SPD)
spectra2CRIGAIIFSCI(SPD, isoTempLinesTable, CCT)
spectra2CRIGAIIFSCI(SPD, isoTempLinesTable)
spectra2CRIGAIIFSCI(SPD)

## End(Not run)
```

---

spectra2ISObrightness *Diffuse blue reflectance factor (ISO brightness)*

---

**Description**

spectra2ISObrightness Diffuse blue reflectance factor (ISO brightness), R457, ISO 2470.

**Usage**

```
spectra2ISObrightness(spectraIn=NA, wlnIn=NA,
RSDmatrix=get("ISObrightnessReflectometerRSD", envir = environment()))
```

**Arguments**

spectraIn	spectral data
wlnIn	wavelength range
RSDmatrix	ISO brightness data

**Value**

LCHuv coordinates

**Author(s)**

Jose Gama

**Source**

ISO board, 2009 ISO 2470-1 : 2009 PAPER, BOARD AND PULPS MEASUREMENT OF DIFFUSE BLUE REFLECTANCE FACTOR PART 1 INDOOR DAYLIGHT CONDITIONS (ISO BRIGHTNESS)

**References**

ISO board, 2009 ISO 2470-1 : 2009 PAPER, BOARD AND PULPS MEASUREMENT OF DIFFUSE BLUE REFLECTANCE FACTOR PART 1 INDOOR DAYLIGHT CONDITIONS (ISO BRIGHTNESS)

**Examples**

```
spectra2ISObrightness(MaterialReferenceData[,c( 'BlueSky')],
MaterialReferenceData[,c('wavelength' )])
```

---

spectra2lux	<i>Illuminance (Lux) from spectra</i>
-------------	---------------------------------------

---

**Description**

spectra2lux Illuminance (Lux) from spectra.

**Usage**

```
spectra2lux(spectraIn=NA, cixyzIn=NA,wlIn=NA, wlInterval=NA)
```

**Arguments**

spectraIn	light source spd
cixyzIn	reference data values
wlIn	range of output wavelengths
wlInterval	arbitrary wavelength interval to be applied to all series through interpolation

**Value**

Correlated Color Temperature (CCT)

**Author(s)**

Jose Gama

**Source**

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI <https://www.lrc.rpi.edu/programs/nlpiip/lightinganswers/pdf/print/lightsources.pdf>

**References**

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI <https://www.lrc.rpi.edu/programs/nlpiip/lightinganswers/pdf/print/lightsources.pdf>

**Examples**

```
spectra2lux(MaterialReferenceData[,c('wavelength', 'BlueSky')])
```

---

 spectra2XYZ

*convert spectral data to tristimulus values*


---

**Description**

spectra2XYZ convert spectral data to tristimulus values.

**Usage**

```
spectra2XYZ(spectraIn=NA, illuminantIn=NA, cixyzIn=NA, wlIn=NA, wlInterval=NA)
```

**Arguments**

spectraIn	spectral data
illuminantIn	illuminant
cixyzIn	range of illuminant wavelengths
wlIn	range of spectral wavelengths
wlInterval	arbitrary wavelength interval to be applied to all series through interpolation

**Value**

XYZ coordinates

**Author(s)**

Jose Gama

**Source**

Andrew S. Glassner, 1995 Principles of digital image synthesis: Vol. 1 Kaufmann

**References**

Andrew S. Glassner, 1995 Principles of digital image synthesis: Vol. 1 Kaufmann

**Examples**

```
spectra2XYZ(MaterialReferenceData[,c('wavelength', 'BlueSky')])
```

---

sprague

*Interpolates an n by w matrix of spectra, sprague*

---

**Description**

sprague Interpolates an n by w matrix of spectra, sprague.

**Usage**

```
sprague(spectra, f)
```

**Arguments**

spectra	spectral data
f	range of wavelengths

**Value**

Interpolated spectral data

**Author(s)**

Jose Gama

**Source**

Stephen Westland, 2014 <http://www.mathworks.com/matlabcentral/fileexchange/40640-computational-colour-content/sprague.m>

**References**

Stephen Westland, 2014 <http://www.mathworks.com/matlabcentral/fileexchange/40640-computational-colour-content/sprague.m>

---

StearnsStearnsCorrection  
*Stearns and Stearns correction*

---

**Description**

StearnsStearnsCorrection Stearns and Stearns correction.

**Usage**

StearnsStearnsCorrection(P)

**Arguments**

P                    XYZ coordinates

**Value**

RGB coordinates

**Author(s)**

Jose Gama

**Source**

Stephen Westland and Caterina Ripamonti, 2004 Computational Colour Science using MATLAB  
John Wiley & Sons Ltd, pp.35

**References**

Stephen Westland and Caterina Ripamonti, 2004 Computational Colour Science using MATLAB  
John Wiley & Sons Ltd, pp.35

---

Stensby68.Whiteness    *Stensby Whiteness*

---

**Description**

Stensby68.Whiteness formula was developed by Mr. P. Stensby (formerly employee of J.R. Geigy AG in US.)

**Usage**

Stensby68.Whiteness(LabHunterMatrix)

**Arguments**

LabHunterMatrix  
Lab Hunter values for illuminant C

**Author(s)**

Jose Gama

**Source**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**References**

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

**Examples**

```
Stensby68.Whiteness(c(0.310897, 0.306510, 74.613450))
```

---

StockmanMacLeodJohnson10degConeFundamentals1993

*Stockman & Sharpe (2000) 10-deg cone fundamentals*

---

**Description**

StockmanMacLeodJohnson10degConeFundamentals1993 Stockman, MacLeod & Johnson (1993) 2-deg cone fundamentals based on the CIE 10-deg CMFs (adjusted to 2-deg).

**Usage**

```
StockmanMacLeodJohnson10degConeFundamentals1993
```

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)

**L10** L-cone spectral sensitivity, L10(lambda)

**M10** M-cone spectral sensitivity, M10(lambda)

**S10** S-cone spectral sensitivity, S10(lambda)

**Author(s)**

Jose Gama

**Source**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

**References**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

**Examples**

```
data(StockmanMacLeodJohnson10degConeFundamentals1993)
StockmanMacLeodJohnson10degConeFundamentals1993
```

---

StockmanMacLeodJohnson2degCIEadjConeFundamentals1993  
*Stockman, MacLeod & Johnson (1993) 2-deg cone fundamentals*

---

**Description**

StockmanMacLeodJohnson2degCIEadjConeFundamentals1993 Stockman, MacLeod & Johnson (1993) 2-deg cone fundamentals based on the CIE 10-deg CMFs (adjusted to 2-deg).

**Usage**

```
StockmanMacLeodJohnson2degCIEadjConeFundamentals1993
```

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

**Author(s)**

Jose Gama

**Source**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

**References**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

**Examples**

```
data(StockmanMacLeodJohnson2degCIEadjConeFundamentals1993)
StockmanMacLeodJohnson2degCIEadjConeFundamentals1993
```

---

StockmanMacLeodJohnson2degStilesBurchConeFundamentals1993  
*Stockman, MacLeod & Johnson (1993) 2-deg fundamentals*

---

**Description**

StockmanMacLeodJohnson2degStilesBurchConeFundamentals1993 Stockman, MacLeod & Johnson (1993) 2-deg fundamentals based on the Stiles & Burch 2-deg CMFs.

**Usage**

```
StockmanMacLeodJohnson2degStilesBurchConeFundamentals1993
```

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)  
**L2** L-cone spectral sensitivity, L2(lambda)  
**M2** M-cone spectral sensitivity, M2(lambda)  
**S2** S-cone spectral sensitivity, S2(lambda)

**Author(s)**

Jose Gama

**Source**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

**References**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

**Examples**

```
data(StockmanMacLeodJohnson2degStilesBurchConeFundamentals1993)
StockmanMacLeodJohnson2degStilesBurchConeFundamentals1993
```



---

StockmanSharpe10degCMFS2000

*Stockman & Sharpe (2000) 10-deg cone fundamentals*

---

### **Description**

StockmanSharpe10degCMFS2000 Stockman & Sharpe (2000) 10-deg cone fundamentals based on the Stiles & Burch 10-deg CMFs linear 5nm.

### **Usage**

StockmanSharpe10degCMFS2000

### **Format**

This data frame contains the following data:

**wlnm** wavelength (nm)

**L10** L-cone spectral sensitivity, L10(lambda)

**M10** M-cone spectral sensitivity, M10(lambda)

**S10** S-cone spectral sensitivity, S10(lambda)

### **Author(s)**

Jose Gama

### **Source**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

### **References**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

### **Examples**

```
data(StockmanSharpe10degCMFS2000)
StockmanSharpe10degCMFS2000
```

---

StockmanSharpe2degCMFadj2000

*Stockman & Sharpe (2000) 2-deg cone fundamentals*

---

### Description

StockmanSharpe2degCMFadj2000 Stockman & Sharpe (2000) 2-deg cone fundamentals based on the Stiles & Burch 10-deg CMFs (adjusted to 2-deg) linear 5nm.

### Usage

StockmanSharpe2degCMFadj2000

### Format

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

### Author(s)

Jose Gama

### Source

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

### References

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

### Examples

```
data(StockmanSharpe2degCMFadj2000)
StockmanSharpe2degCMFadj2000
```

---

SystemISCCNBS

*ISCC-NBS System*

---

### Description

SystemISCCNBS is a table with the ISCC-NBS System data.

### Usage

SystemISCCNBS

### Format

This data frame contains the following data:

**HueInterval** interval of hues in the hue chart defining the elementary block

**Hmin** minimum ASTM D1535 Hue for the elementary block

**Hmax** maximum ASTM D1535 Hue for the elementary block

**Vmin** minimum Value for the elementary block

**Vmax** maximum Value for the elementary block

**Cmin** minimum Chroma for the elementary block

**Cmax** maximum Chroma for the elementary block. Cmax=Inf for some elementary blocks.

**Number** color number of the elementary block, from 1 to 267

### Author(s)

Glenn Davis

### References

Color : Universal Language and Dictionary of Names ISCC-NBS Method of Designating Colors and a Dictionary of Color Names Kelly, Kenneth Low Judd, Deane Brewster NBS Special Publication 440 December 1976 Section 13: Color Name Charts, pp. 16-31

### Examples

```
data(SystemISCCNBS)
SystemISCCNBS
```

---

Taube60.Whiteness      *Taube Whiteness*

---

### Description

Taube60.Whiteness developed by Mr. Taube (formerly an employee of BASF AG, Germany). It was presented in 1960 and has found it's application mainly in the plastic sector.

### Usage

```
Taube60.Whiteness(XYZmatrix, illuminant = "D65", observer = 2, RefWhite  
                  = get("XYZperfectreflectingdiffuser", envir = environment()))
```

### Arguments

XYZmatrix	CIE tristimulus values for illuminant C
illuminant	illuminant
observer	observer
RefWhite	White reference

### Author(s)

Jose Gama

### Source

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### References

Xrite, 2012 Color iQC and Color iMatch Color Calculations Guide Version 8.0 30 July 2012 Revision 1.0

### Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)  
Taube60.Whiteness(XYZ)
```

---

TCSdata

*The spectral reflectance data of 14 color test samples for CRI*

---

**Description**

TCSdata is a table with the spectral reflectance data of 14 color test samples for CRI.

**Usage**

TCSdata

**Format**

This data frame contains the following data:

**wavelength** wavelength (nm)

**TCS1** spectral reflectance data for sample 1

**TCS2** spectral reflectance data for sample 2

**TCS3** spectral reflectance data for sample 3

**TCS4** spectral reflectance data for sample 4

**TCS5** spectral reflectance data for sample 5

**TCS6** spectral reflectance data for sample 6

**TCS7** spectral reflectance data for sample 7

**TCS8** spectral reflectance data for sample 8

**TCS9** spectral reflectance data for sample 9

**TCS10** spectral reflectance data for sample 10

**TCS11** spectral reflectance data for sample 11

**TCS12** spectral reflectance data for sample 12

**TCS13** spectral reflectance data for sample 13

**TCS14** spectral reflectance data for sample 14

**Author(s)**

Jose Gama

**Source**

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI <https://www.lrc.rpi.edu/programs/nlpip/lightinganswers/pdf/print/lightsources.pdf>

## References

Rensselaer Polytechnic Institute Light Sources and Color Q & A Appendix B: MATLAB script for calculating measures of light source color: CCT, CRI, GA, and FSI <https://www.lrc.rpi.edu/programs/nlpi/lightinganswers/pdf/print/lightsources.pdf>

## Examples

```
data(TCSdata)
TCSdata
```

---

tristimulusMunsell     *434 Munsell colors with tristimulus and CMFs for a few illuminants*

---

## Description

tristimulusMunsell is a table with 434 Munsell colors with tristimulus and Color matching functions for illuminants A, C D and S.

## Usage

```
tristimulusMunsell
```

## Format

This data frame contains the following data:

**Munsell** Munsell color notation  
**X.A** tristimulus X for illuminant A  
**Y.A** tristimulus Y for illuminant A  
**Z.A** tristimulus Z for illuminant A  
**x.A** CMF x for illuminant A  
**y.A** CMF y for illuminant A  
**X.C** tristimulus X for illuminant C  
**Y.C** tristimulus Y for illuminant C  
**Z.C** tristimulus Z for illuminant C  
**x.C** CMF x for illuminant C  
**y.C** CMF y for illuminant C  
**X.D** tristimulus X for illuminant D  
**Y.D** tristimulus Y for illuminant D  
**Z.D** tristimulus Z for illuminant D  
**x.D** CMF x for illuminant D  
**y.D** CMF y for illuminant D

**X.S** tristimulus for X illuminant S  
**Y.S** tristimulus for Y illuminant S  
**Z.S** tristimulus for Z illuminant S  
**x.S** CMF x for illuminant S  
**y.S** CMF y for illuminant S  
**X** Munsell painting number

**Author(s)**

Jose Gama

**Source**

K. L. Kelley, K. S. Gibson, and D. Nickerson, 1943 "Tristimulus specification of the Munsell Book of Color from spectrophotometric measurements," J. Opt. Soc. Am. 33, 355–376

**References**

K. L. Kelley, K. S. Gibson, and D. Nickerson, 1943 "Tristimulus specification of the Munsell Book of Color from spectrophotometric measurements," J. Opt. Soc. Am. 33, 355–376

**Examples**

```
data(tristimulusMunsell)
tristimulusMunsell
```

---

VosEstevezWalraven2degConeFundamentals1990

*Vos, Estévez & Walraven (1990) 2-deg cone fundamentals*

---

**Description**

VosEstevezWalraven2degConeFundamentals1990 Vos, Estévez & Walraven (1990) 2-deg fundamentals based on the Stiles & Burch 2-deg CMFs.

**Usage**

VosEstevezWalraven2degConeFundamentals1990

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)  
**L2** L-cone spectral sensitivity, L2(lambda)  
**M2** M-cone spectral sensitivity, M2(lambda)  
**S2** S-cone spectral sensitivity, S2(lambda)

**Author(s)**

Jose Gama

**Source**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

**References**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)

**Examples**

```
data(VosEstevezWalraven2degConeFundamentals1990)
VosEstevezWalraven2degConeFundamentals1990
```

---

VosWalraven2degConeFundamentals1971

*Vos & Walraven(1971) 2-deg cone fundamentals*

---

**Description**

VosWalraven2degConeFundamentals1971 Vos & Walraven(1971) 2-deg cone fundamentals based on the CIE Judd-Vos 2-deg CMFs.

**Usage**

```
VosWalraven2degConeFundamentals1971
```

**Format**

This data frame contains the following data:

**wlnm** wavelength (nm)

**L2** L-cone spectral sensitivity, L2(lambda)

**M2** M-cone spectral sensitivity, M2(lambda)

**S2** S-cone spectral sensitivity, S2(lambda)

**Author(s)**

Jose Gama

**Source**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London [www.cvrl.org](http://www.cvrl.org)



**References**

The Colour & Vision Research laboratory(CVRL) Institute of Ophthalmology, University College London www.cvrl.org

**Examples**

```
data(VosWalraven2degConeFundamentals1971)
VosWalraven2degConeFundamentals1971
```

---

WestlandBlacknessIndex

*Westland, et al. blackness index*

---

**Description**

WestlandBlacknessIndex (Westland, et al., 2006) blackness index.

**Usage**

```
WestlandBlacknessIndex(CIELabMatrix)
```

**Arguments**

CIELabMatrix    CIELab coordinates

**Value**

blackness index

**Author(s)**

Jose Gama

**Source**

Westland, S.; Cheung, T. L. V.; Lozman, O. R., 2006. A metric for predicting perceptual blackness. 14th Color Imaging Conference Final Program and Proceedings, 14-17.

**References**

Westland, S.; Cheung, T. L. V.; Lozman, O. R., 2006. A metric for predicting perceptual blackness. 14th Color Imaging Conference Final Program and Proceedings, 14-17.

**Examples**

```
CIELab<-c(34.78467, 28.15159, 3.024663)
WestlandBlacknessIndex(CIELab)
```

---

whitepointsilluminants

*White points of standard illuminants*

---

### Description

whitepointsilluminants is a table with White points of standard illuminants.

### Usage

```
whitepointsilluminants
```

### Format

This data frame contains the following data:

**illuminant** illuminant

**description** description

**x2** x2

**y2** y2

**x10** x10

**y10** y10

**CCT** CCT

### Author(s)

Jose Gama

### Source

Wikipedia, 2014 White points of standard illuminants [https://en.wikipedia.org/wiki/Standard\\_illuminant](https://en.wikipedia.org/wiki/Standard_illuminant)

### References

Wikipedia, 2014 White points of standard illuminants [https://en.wikipedia.org/wiki/Standard\\_illuminant](https://en.wikipedia.org/wiki/Standard_illuminant)

### Examples

```
data(whitepointsilluminants)
whitepointsilluminants
```

---

whitepointsRGB      *Primaries for RGB color spaces*

---

**Description**

whitepointsRGB is a table with primaries for RGB color spaces.

**Usage**

```
whitepointsRGB
```

**Format**

This data frame contains the following data:

**xRed** Primary red x  
**yRed** Primary red y  
**xGreen** Primary green x  
**yGreen** Primary green y  
**xBlue** Primary blue x  
**yBlue** Primary blue y  
**whitepointilluminant** illuminant  
**gamma** gamma  
**description** Color space name

**Author(s)**

Jose Gama

**Source**

Wikipedia, 2014 RGB color space [https://en.wikipedia.org/wiki/RGB\\_color\\_space](https://en.wikipedia.org/wiki/RGB_color_space)

**References**

Wikipedia, 2014 RGB color space [https://en.wikipedia.org/wiki/RGB\\_color\\_space](https://en.wikipedia.org/wiki/RGB_color_space)

**Examples**

```
data(whitepointsRGB)  
whitepointsRGB
```

---

`w1nm2XYZ`*Approximates wavelength to CIE tristimulus XYZ*

---

**Description**

`w1nm2XYZ` Approximates wavelength to CIE tristimulus XYZ, by interpolation.

`w1nm2xyz` Approximates wavelength to CIE xyz, by interpolation.

**Usage**

`w1nm2XYZ(wavelength)`

**Arguments**

`wavelength`      `wavelength`

**Value**

CIE XYZ

**Author(s)**

Jose Gama

**Examples**

`w1nm2XYZ(555)`

---

`xFit_1931`*Approximations from wavelengths to XYZ by Wyman et al*

---

**Description**

`xFit_1931` Approximations from wavelengths to XYZ by Wyman et al.

**Usage**

`xFit_1931(wave)`

**Arguments**

`wave`              `wavelength data`

**Value**

XYZ X, Y or Z coordinate

**Author(s)**

Jose Gama

**Source**

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

**References**

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

**Examples**

xFit\_1931(555)  
yFit\_1931(555)  
zFit\_1931(555)

---

xy2CCT.HernandezAndres

*convert from chromaticity coordinates to correlated color temperature  
(Hernandez Andres)*

---

**Description**

xy2CCT.HernandezAndres convert from chromaticity coordinates to correlated color temperature (approximation) by Hernandez Andres.

**Usage**

xy2CCT.HernandezAndres(x,y)

**Arguments**

x	x coordinates
y	y coordinates

**Value**

CCT (Hernandez Andres)

**Author(s)**

Jose Gama

**Source**

Hernandez-Andres, et al. 1999 "Calculating correlated color temperatures across the entire gamut of daylight and skylight chromaticities" [https://en.wikipedia.org/wiki/Color\\_temperature](https://en.wikipedia.org/wiki/Color_temperature)

**References**

Hernandez-Andres, et al. 1999 "Calculating correlated color temperatures across the entire gamut of daylight and skylight chromaticities" [https://en.wikipedia.org/wiki/Color\\_temperatures](https://en.wikipedia.org/wiki/Color_temperatures)

**Examples**

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
xy2CCT.HernandezAndres(xyY[1], xyY[2])
```

---

xy2CCT.McCamy	<i>convert from chromaticity coordinates to correlated color temperature</i>
---------------	--

---

**Description**

xy2CCT.McCamy convert from chromaticity coordinates to correlated color temperature (approximation).

**Usage**

```
xy2CCT.McCamy(x, y)
```

**Arguments**

x	x coordinates
y	y coordinates

**Value**

CCT McCamy

**Author(s)**

Jose Gama

**Source**

C. S. McCamy, 1992 "Correlated color temperature as an explicit function of chromaticity coordinates" Color Research & Application Volume 17, Issue 2, pages 142–144

**References**

C. S. McCamy, 1992 "Correlated color temperature as an explicit function of chromaticity coordinates" Color Research & Application Volume 17, Issue 2, pages 142–144

### Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
xy2CCT.McCamy(xyY[1],xyY[2])
```

---

xyChromaticitiesVos1978

*x, y coordinates transformed to Judd (1951) x', y' system*

---

### Description

xyChromaticitiesVos1978 x, y coordinates transformed to Judd (1951) x', y' system.

### Usage

```
xyChromaticitiesVos1978(x,y)
```

### Arguments

x	x coordinate
y	y coordinate

### Value

x', y' coordinates

### Author(s)

Jose Gama

### Source

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

### References

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

### Examples

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
xyChromaticitiesVos1978(xyY[1],xyY[2])
```

---

xyY2XYZ

*Convert CIE CMF to XYZ*

---

**Description**

xyY2XYZ Converts CIE CMF to XYZ.

**Usage**

xyY2XYZ(xyYmatrix)

**Arguments**

xyYmatrix      CIE CMFs

**Value**

XYZ coordinates

**Author(s)**

Jose Gama

**Source**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**References**

Logicol S.r.l., 2014 EasyRGB color search engine <http://www.easyrgb.com/>

**Examples**

xyY2XYZ(c(0.310897, 0.306510, 74.613450))

---

XYZ2BVR

*convert from XYZ coordinates to BVR*

---

**Description**

XYZ2BVR convert from XYZ coordinates to BVR.

**Usage**

XYZ2BVR(XYZmatrix)



**Arguments**

XYZmatrix      XYZ coordinates

**Value**

BVR coordinates

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**References**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**Examples**

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
XYZ2BVR(XYZ)
```

---

XYZ2CCT.Robertson      *convert from chromaticity coordinates to correlated color temperature (Robertson)*

---

**Description**

XYZ2CCT.Robertson convert from chromaticity coordinates to correlated color temperature (approximation) by Robertson.

**Usage**

```
XYZ2CCT.Robertson(X, Y, Z)
```

**Arguments**

X                  X coordinates  
Y                  Y coordinates  
Z                  Z coordinates

**Value**

CCT (Robertson)

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**References**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**Examples**

```
XYZ2CCT.Robertson( 0.11465380, 0.08391198, 0.08222077 )
```

---

XYZ2HunterLab

*convert from XYZ coordinates to Hunter Lab coordinates*

---

**Description**

XYZ2HunterLab convert from XYZ coordinates to Hunter Lab coordinates.

**Usage**

```
XYZ2HunterLab(XYZmatrix, illuminant='D65', observer=2,  
RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

XYZmatrix	XYZ coordinates
illuminant	illuminant
observer	observer
RefWhite	Reference White

**Value**

Hunter Lab coordinates

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

## References

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
XYZ2HunterLab(XYZ)
```

---

XYZ2Lab

*convert from XYZ coordinates to CIE Lab coordinates*

---

## Description

XYZ2Lab convert from XYZ coordinates to CIE Lab coordinates.

## Usage

```
XYZ2Lab(XYZmatrix, illuminant='D65', observer=2,
        RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

XYZmatrix	XYZ coordinates
illuminant	illuminant
observer	observer
RefWhite	Reference White

## Value

CIE Lab coordinates

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

## References

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**Examples**

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
CIELMatrix<-XYZ2Lab(XYZ*100)
```

---

XYZ2LMS

*Convert XYZ coordinates to LMS*

---

**Description**

XYZ2LMS Converts XYZ coordinates to LMS.

**Usage**

```
XYZ2LMS(XYZmatrix)
```

**Arguments**

XYZmatrix      XYZ coordinates

**Value**

LMS coordinates

**Author(s)**

Jose Gama

**Source**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**References**

Francoise Vienot, Hans Brettel, John D. Mollon, 1999 Digital Video Colourmaps for Checking the Legibility of Displays by Dichromats Color Research & Application John Wiley & Sons, Inc.

**Examples**

```
XYZ<-c(21.43162, -3.20673, 120.6259)
XYZ2LMS(XYZ)
```

---

XYZ2Luv                      *convert from XYZ coordinates to CIE Luv coordinates*

---

## Description

XYZ2Luv convert from XYZ coordinates to CIE Luv coordinates.

## Usage

```
XYZ2Luv(XYZmatrix, illuminant='D65', observer=2,  
RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

XYZmatrix	XYZ coordinates
illuminant	illuminant
observer	observer
RefWhite	Reference White

## Value

CIE Luv coordinates

## Author(s)

Jose Gama

## Source

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

## References

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)  
CIELuvMatrix<-XYZ2Luv(XYZ*100)
```

---

 XYZ2RGB

*convert from XYZ coordinates to CIE RGB coordinates*


---

**Description**

XYZ2RGB convert from XYZ coordinates to CIE RGB coordinates.

**Usage**

```
XYZ2RGB(XYZmatrix, illuminant = "D65", observer = 2, RefWhite
        = get("XYZperfectreflectingdiffuser", envir = environment()),
        RGBModel = "sRGB", RefWhiteRGB = get("whitepointsRGB",
        envir = environment()), gamma = NA,
        RefWhiteIllum = get("XYZperfectreflectingdiffuser",
        envir = environment()), CAT = "Bradford",
        CATarray = get("ChromaticAdaptation", envir = environment()))
```

**Arguments**

XYZmatrix	XYZ coordinates
illuminant	illuminant
observer	observer
RefWhite	Reference White
RGBModel	RGB model
RefWhiteRGB	white points for RGB model
gamma	gamma
RefWhiteIllum	Reference perfect reflecting diffuser
CAT	CAT
CATarray	Chromatic Adaptation

**Value**

CIE RGB coordinates

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

## References

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
XYZ2RGB(XYZ)
```

---

XYZ2RxRyRz	<i>convert from XYZ to three filter measurements (reflectance factors)</i>
------------	--

---

## Description

XYZ2RxRyRz convert from XYZ to three filter measurements (reflectance factors).

## Usage

```
XYZ2RxRyRz(XYZmatrix=NA,illuminant='C', observer=2,
RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

## Arguments

XYZmatrix	XYZ matrix
illuminant	illuminant
observer	observer
RefWhite	White Reference

## Value

CIE XYZ coordinates

## Author(s)

Jose Gama

## Examples

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
XYZ2RxRyRz(XYZ)
```

---

`XYZ2xyY`*convert from XYZ coordinates to xyY coordinates*

---

**Description**

XYZ2xyY convert from XYZ coordinates to xyY coordinates.

**Usage**

```
XYZ2xyY(XYZmatrix, illuminant='D65', observer=2,  
RefWhite=get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

XYZmatrix	XYZ coordinates
illuminant	illuminant
observer	observer
RefWhite	Reference White

**Value**

xyY coordinates

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**References**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**Examples**

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)  
XYZ2xyY(XYZ)
```



---

XYZ2Yuv	<i>convert from XYZ coordinates to Yuv coordinates</i>
---------	--

---

**Description**

XYZ2Yuv convert from XYZ coordinates to Yuv coordinates.

**Usage**

```
XYZ2Yuv(XYZmatrix)
```

**Arguments**

XYZmatrix      XYZ coordinates

**Value**

Yuv coordinates

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**References**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**Examples**

```
XYZ<-c(0.11465380, 0.08391198, 0.08222077)
XYZ2Yuv(XYZ)
```

---

XYZMoonSpencer1945     *Approximations from wavelengths to XYZ by Moon & Spencer*

---

**Description**

XYZMoonSpencer1945 Approximations from wavelengths to XYZ by Moon & Spencer.

**Usage**

XYZMoonSpencer1945(wavelen)

**Arguments**

wavelen            wavelength data

**Value**

XYZ coordinates

**Author(s)**

Jose Gama

**Source**

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

**References**

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

**Examples**

XYZMoonSpencer1945(555)

---

XYZperfectreflectingdiffuser  
*Perfect reflecting diffuser data*

---

**Description**

XYZperfectreflectingdiffuser table with perfect reflecting diffuser data.

**Format**

This data frame contains the following columns:

**Illuminant** Illuminant

**X2** CIE tristimulus X 2 deg observer

**Y2** CIE tristimulus Y 2 deg observer

**Z2** CIE tristimulus Z 2 deg observer

**X10** CIE tristimulus X 10 deg observer

**Y10** CIE tristimulus Y 10 deg observer

**Z10** CIE tristimulus Z 10 deg observer

**Author(s)**

Jose Gama

**Source**

Wyszecki, G. and Stiles, W.S., 1982 Color Science: Concepts and Methods, Quantitative data and formulae. John Wiley & Sons.

**References**

Wyszecki, G. and Stiles, W.S., 1982 Color Science: Concepts and Methods, Quantitative data and formulae. John Wiley & Sons.

**Examples**

```
data(XYZperfectreflectingdiffuser)
str(XYZperfectreflectingdiffuser)
```

---

XYZTannenbaum1974      *Approximations from wavelengths to XYZ by Tannenbaum 1974*

---

**Description**

XYZTannenbaum1974 Approximations from wavelengths to XYZ by Tannenbaum 1974.

**Usage**

XYZTannenbaum1974(wavelen)

**Arguments**

wavelen              wavelength data

**Value**

XYZ coordinates

**Author(s)**

Jose Gama

**Source**

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

**References**

Chris Wyman Peter-Pike Sloan Peter Shirley, 2013 Simple Analytic Approximations to the CIE XYZ Color Matching Functions Journal of Computer Graphics Techniques Vol. 2, No. 2

**Examples**

XYZTannenbaum1974(555)

---

`XYZtoRGB`*convert from XYZ coordinates to RGB*

---

**Description**

XYZtoRGB convert from XYZ coordinates to RGB.

**Usage**

```
XYZtoRGB(xc, yc, zc, ColorSystem = c(0.67, 0.33, 0.21, 0.71,  
                                     0.14, 0.08, 0.31, 0.316))
```

**Arguments**

<code>xc</code>	XYZ X coordinates
<code>yc</code>	XYZ Y coordinates
<code>zc</code>	XYZ Z coordinates
<code>ColorSystem</code>	RGB Color System data

**Value**

RGB coordinates

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**References**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**Examples**

```
XYZtoRGB(0.11465380, 0.08391198, 0.08222077)
```

---

Y2MunsellV                      *CIE XYZ "Y" to Munsell value*

---

**Description**

Y2MunsellV CIE XYZ "Y" to Munsell value.

**Usage**

Y2MunsellV(Y)

**Arguments**

Y                      Y data

**Value**

Munsell value

**Author(s)**

Jose Gama

**Source**

ASTM, 2008 ASTM Standard D1535-08

**References**

ASTM, 2008 ASTM Standard D1535-08

**Examples**

Y2MunsellV(5)

---

Y2MunsellVtable1D1535    *CIE XYZ "Y" to Munsell value formula, based on the ASTM Standard D1535-08*

---

**Description**

Y2MunsellVtable1D1535 NLSQ regression for obtaining similar results to table 1 from ASTM Standard D1535-08.

**Usage**

Y2MunsellVtable1D1535(Y)

**Arguments**

Y                    Y data

**Value**

Munsell value

**Author(s)**

Jose Gama

**Source**

ASTM, 2008 ASTM Standard D1535-08

**References**

ASTM, 2008 ASTM Standard D1535-08

**Examples**

Y2Munsell1Vtable1D1535(5)

---

YCbCr2RGB

*Convert YCbCr coordinates to RGB*

---

**Description**

YCbCr2RGB Converts YCbCr coordinates to RGB.

**Usage**

YCbCr2RGB(YPbPrmatrix)

**Arguments**

YPbPrmatrix       YPbPr coordinates

**Value**

RGB coordinates

**Author(s)**

Jose Gama

**Source**

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

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**Examples**

```
YCbCr2RGB(c(18165.831, -625.617, 6558.790))
```

---

YIQ2RGB

*Convert YIQ coordinates to RGB*

---

**Description**

YIQ2RGB Converts YIQ coordinates to RGB.

**Usage**

```
YIQ2RGB(YIQmatrix)
```

**Arguments**

YIQmatrix      YIQ coordinates

**Value**

RGB coordinates

**Author(s)**

Jose Gama

**Source**

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

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**Examples**

```
YIQ2RGB(c(82.949, 31.51965, 17.58261))
```

---

YPbPr2RGB

*Convert YCbCr coordinates to RGB*

---

**Description**

YPbPr2RGB Converts YCbCr coordinates to RGB.

**Usage**

```
YPbPr2RGB(YPbPrmatrix)
```

**Arguments**

YPbPrmatrix    YPbPr coordinates

**Value**

RGB coordinates

**Author(s)**

Jose Gama

**Source**

Alex Izvorski, Copyright 2003-2005 (Portions Copyright 2001-2003 by Alfred Reibenschuh) Graphics/ColorObject version 0.5.0 [https://www.poynton.ca/notes/colour\\_and\\_gamma/ColorFAQ.txt](https://www.poynton.ca/notes/colour_and_gamma/ColorFAQ.txt)

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**Examples**

```
YPbPr2RGB(c(82.949000, -2.792896, 29.280320))
```

Yuv2Luv

*Convert Yuv coordinates to Luv*

---

**Description**

Yuv2Luv Converts Yuv coordinates to Luv.

**Usage**

```
Yuv2Luv(Yu.v.matrix, illuminant = "D65", observer = 2,  
        RefWhite = get("XYZperfectreflectingdiffuser", envir = environment()))
```

**Arguments**

Yu.v.matrix	Yuv matrix
illuminant	illuminant
observer	observer
RefWhite	Reference White

**Value**

Luv coordinates

**Author(s)**

Jose Gama

**Examples**

```
Yuv <- c(0.08391198, 0.2830965, 0.4661789)  
Yuv2Luv(Yuv)
```

---

YUV2RGB*Convert YUV coordinates to RGB*

---

**Description**

YUV2RGB Converts YUV coordinates to RGB.

**Usage**

```
YUV2RGB(YUVmatrix)
```

**Arguments**

YUVmatrix	YUV coordinates
-----------	-----------------

**Value**

RGB coordinates

**Author(s)**

Jose Gama

**Examples**

```
YUV2RGB(c(164.898, -5.584651, 58.53939))
```

---

Yuv2xy

*convert from Yuv coordinates to xy coordinates*

---

**Description**

Yuv2xy convert from Yuv coordinates to xy coordinates.

**Usage**

```
Yuv2xy(Yu.v.matrix)
```

**Arguments**

Yu.v.matrix    Yuv coordinates

**Value**

xy coordinates

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

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Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**Examples**

```
Yuv <- c(0.08391198, 0.2830965, 0.4661789)
Yuv2xy(Yuv)
```

---

Yuv2XYZ                      *convert from Yuv coordinates to XYZ coordinates*

---

**Description**

Yuv2XYZ convert from Yuv coordinates to XYZ coordinates.

**Usage**

```
Yuv2XYZ(Yu.v.matrix)
```

**Arguments**

Yu.v.matrix      Yuv coordinates

**Value**

XYZ coordinates

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**References**

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**Examples**

```
Yuv <- c(0.08391198, 0.2830965, 0.4661789)
Yuv2XYZ(Yuv)
```

---

Yxy2CIE1960UCS      *convert from Yxy coordinates to CIE 1960 UCS*

---

**Description**

Yxy2CIE1960UCS convert from Yxy coordinates to CIE 1960 UCS.

**Usage**

```
Yxy2CIE1960UCS(Yxymatrix)
```

**Arguments**

Yxymatrix      Yxy coordinates

**Value**

CIE 1960 UCS

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**References**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**Examples**

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
Yxy2CIE1960UCS(xyY[c(3,1,2)])
```

---

`Yxy2Yuv`*convert from Yxy coordinates to Yuv coordinates*

---

**Description**

Yxy2Yuv convert from Yxy coordinates to Yuv coordinates.

**Usage**

```
Yxy2Yuv(Yxymatrix)
```

**Arguments**

Yxymatrix      Yxy coordinates

**Value**

Yuv coordinates

**Author(s)**

Jose Gama

**Source**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**References**

Bruce Justin Lindbloom, 2014 [http://www.brucelindbloom.com/index.html?Eqn\\_XYZ\\_to\\_T.html](http://www.brucelindbloom.com/index.html?Eqn_XYZ_to_T.html)

**Examples**

```
xyY <- c(0.4083308, 0.2988462, 0.08391198)
Yxy2Yuv(xyY[c(3,1,2)])
```

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