In [1]:
```
install.packages("NLP")
```

```
Installing package into 'C:/Users/user/Documents/R/win-library/3.4'
(as 'lib' is unspecified)

package 'NLP' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
	C:\Users\user\AppData\Local\Temp\RtmpaYdVuv\downloaded_packages
```

In [2]:
```
library(NLP)
```

In [3]:
```
install.packages("tm", repos='http://cran.us.r-project.org')
```

```
Installing package into 'C:/Users/user/Documents/R/win-library/3.4'
(as 'lib' is unspecified)

package 'tm' successfully unpacked and MD5 sums checked

Warning message:
"cannot remove prior installation of package 'tm'"

The downloaded binary packages are in
	C:\Users\user\AppData\Local\Temp\RtmpaYdVuv\downloaded_packages
```

In [50]:
```
library(tm)
```

In [5]:
```
install.packages("tm", lib = 'C:/Users/user/Anaconda3/Lib/R/library', repos=
'http://cran.us.r-project.org')
```

```
package 'tm' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
	C:\Users\user\AppData\Local\Temp\RtmpaYdVuv\downloaded_packages
```

In [51]:
```
library(tm)
```

In [7]:
```
read.csv("Literature.csv")
```

userid	contentid	date	text	Topic.Code	rating
12503	45322	Mon Apr 06 22:45:40 PDT 2009	Bad news was Dad has cancer and is dying Good news new business started and I am now a life coach practising holistic weight management	12	2
16266	446	Mon Apr 06 23:01:15 PDT 2009	im lonely keep me company! 22 female, new york	12	3
16625	4421	Mon Apr 06 23:21:30 PDT 2009	Sad about Kutner being killed off my fav show House!	20	4
16194	44413	Tue Apr 07 01:03:56 PDT 2009	is going to priceline (city) tomorrow, but lost her 'must haves' list	5	2
10628	44312	Tue Apr 07 03:16:35 PDT 2009	Difficulties with GTalk Closing the Division for the day. Later, everyone.	29	1
13449	4482	Tue Apr 07 03:51:52 PDT 2009	4 hours of school this afternoon	16	5
18826	443112	Tue Apr 07 05:07:33 PDT 2009	I meant "rly" not "fly" in my other tweet	20	4
12966	4451	Tue Apr 07 05:52:49 PDT 2009	@Kal_Penn The episode broke my heart, even though we'd speculated that this was what was coming Will miss you terribly on the show.	15	5

userid	contentid	date	text	Topic.Code	rating
18123	451220	Tue Apr 07 08:44:21 PDT 2009	@peteeee work then who knows	31	2
14547	45322	Fri Apr 17 21:16:26 PDT 2009	sunburnt from lying out in the sun all day undeterred from continuing to lie in the sun tomorrow	2	3
14220	446	Sat Apr 18 07:16:18 PDT 2009	4 hours of english class on satudays is tiring	19	5
11750	44412	Sat Apr 18 07:36:31 PDT 2009	Never expected Chennai would lose the match #ipl	1	1
19458	45112	Sat Apr 18 09:20:03 PDT 2009	is at home nursing his cold... My friend called me this morning with an extra Long Beach Grand Prix ticket... a no go for me.	3	4
18092	44312	Sat Apr 18 14:54:32 PDT 2009	We just finished 10 seasons of Friends in two months Now what are we going to watch?!!??!	6	3
14002	4421	Sat Apr 18 16:53:24 PDT 2009	@lizwoolly @LouiseBrig @alansheppard Thank you. Hope to hit sleep soon, but have a tooth dilemma going on	3	4
16029	443112	Sat Apr 18 17:12:40 PDT 2009	Still at office working on coursework http://bit.ly/l53Gv	3	2

userid	contentid	date	text	Topic.Code	rating
13701	446	Sat Apr 18 20:32:03 PDT 2009	@Leslie_G stack is injured are you a rowdy fan? Do you think we'll go 2-0? Was a great game...	16	5
11923	45112	Sat Apr 18 20:35:19 PDT 2009	i wish i was in the bahamas to see the @jonasbrothers i love you guys <3 good luck at your concert!	13	3
14514	45322	Sun Apr 19 00:52:42 PDT 2009	@Badnews84 its not funny I'm hurt	19	5
12773	4421	Sun Apr 19 01:23:32 PDT 2009	is still alone	24	5
15011	4481	Sun Apr 19 02:47:42 PDT 2009	forgot to wish @HelentheKing the best of look for her interview today! ps last night got worse! and i was very tired!	3	4
15716	44312	Sun Apr 19 02:50:03 PDT 2009	@vlad_dracul I called you twice	15	3
12569	443111	Sun Apr 19 04:56:58 PDT 2009	I need more batteries	13	2
18049	45322	Sun Apr 19 09:25:12 PDT 2009	cheer then back to do homework. lame.	19	3

userid	contentid	date	text	Topic.Code	rating
11151	4451	Sun Apr 19 11:10:09 PDT 2009	googled the film`17` that every1 talkin about and got "17 (seventeen) is the natural number following 16 and preceding 18. It is prime."	16	4
16790	45322	Sun Apr 19 23:00:23 PDT 2009	Watching Stan sleep...what fun for me	20	5
16075	45111	Sun Apr 19 23:00:56 PDT 2009	wasn't able to join his friends AGAIN because he slept late	19	1
10661	446	Sun Apr 19 23:42:39 PDT 2009	@taramasatala me miss them already..	20	1
18427	451220	Mon Apr 20 01:07:26 PDT 2009	damn i need to cuddle	2	2
11708	44412	Mon Apr 20 02:24:55 PDT 2009	2 hour flight delay, fuel stop in Manchester and now the bloody tube train is stuck @ Hounslow East ... Welcome to Monday	20	3
...	...	...	...	...	...
58624	44413	Sat Jun 06 15:56:42 PDT 2009	awaiting the Pens vs Detroit Game...LET'S GO PENS!	16	1
52919	45112	Sat Jun 06 19:48:33 PDT 2009	I've surrendered my computer to my mother. Time for a nap Bbq was fun today, especially the ambush.... >]	20	1

userid	contentid	date	text	Topic.Code	rating
53119	443111	Sat Jun 06 21:55:14 PDT 2009	@KimKardashian Of course we know the amazing photographer Mario Testino. He's royalty! -- well at least to me he is	19	2
59012	4451	Sat Jun 06 22:03:18 PDT 2009	@TomboyTigress but it was warm water in a/c so i'm so fresh and so clean clean	2	3
59386	45322	Sun Jun 07 00:45:59 PDT 2009	@SinnamonS thanks	19	4
55446	451211	Sun Jun 07 01:50:00 PDT 2009	Having a out side tacos bbq while listening to some Cubana. This one is pretty good, give it a listen "QuÃ© ... â™« http://blip.fm/~7sc8y	19	2
52701	4481	Sun Jun 07 05:16:56 PDT 2009	going to practice my parking. birthday in 19	20	3
54565	4422	Sun Jun 07 05:53:11 PDT 2009	@racheloserr hihi thankyou	20	4
57454	45321	Sun Jun 07 11:45:35 PDT 2009	blah. going to test drive MORE cars with mi madre...text me	13	2
52269	45322	Sun Jun 07 13:35:47 PDT 2009	talked to both my babies this rainy day	19	1

userid	contentid	date	text	Topic.Code	rating
56227	44831	Sun Jun 07 14:13:02 PDT 2009	rice with porkchops for dinner	15	5
52022	4451	Sun Jun 07 17:04:40 PDT 2009	@stinginthetail gosh that sounds terrible <-- font sarcasitca	16	4
54250	4421	Sun Jun 07 18:01:15 PDT 2009	photoshoot today for a hair salon time to get creative!!!	20	5
59521	4451	Sun Jun 07 19:02:20 PDT 2009	Loved worship tonight! I think God might be pulling me in a new direction... Very exciting!	20	2
51569	4422	Sun Jun 07 19:42:08 PDT 2009	@whitking10 totally hooked on Sims 3 thanks to you, darling My Sim is such a hoochie, too! LOL!	3	3
56840	45111	Mon Jun 15 00:28:19 PDT 2009	hey everyone I hope all is well I'm in a good mood and I'm hungry as well	12	5
58039	4413	Mon Jun 15 02:07:00 PDT 2009	@letronje tried out rubystein, works	3	1
59946	4482	Mon Jun 15 04:54:33 PDT 2009	@officialmgnfox It's good sign I'm happy to see you in twitter.	19	4

userid	contentid	date	text	Topic.Code	rating
55702	4481	Mon Jun 15 06:51:45 PDT 2009	Btw, watching funny videos when sitting in a library .... big no-no!!	16	3
57765	446	Mon Jun 15 12:30:47 PDT 2009	@JvdMeulen Snow Leopard	29	2
59725	44412	Mon Jun 15 13:37:49 PDT 2009	@billyraycyrus whos that???	3	3
59660	4421	Mon Jun 15 13:37:58 PDT 2009	Help us get 1000 fans on facebook so we can pick a direct link http://bit.ly/DVPTH	16	4
51774	45111	Mon Jun 15 14:33:36 PDT 2009	@jasminedotiwala Oh i just cant wait 4 it! Thanks 4 ur answer, honey! U're sooooo kind!	10	2
59440	446	Mon Jun 15 14:35:25 PDT 2009	Soo excited for Lines, Vines, and Trying Times @jonasbrothers	1	1
51478	4451	Mon Jun 15 19:28:24 PDT 2009	@SethApollo I know i know!	16	5
56510	44312	Mon Jun 15 20:37:07 PDT 2009	Time for my kittie bed. Goodnight	16	4

userid	contentid	date	text	Topic.Code	rating
50258	443111	Mon Jun 15 20:41:15 PDT 2009	@apparently_so @theirishheather !	12	5
59730	4422	Tue Jun 16 02:39:05 PDT 2009	@LenoOsh hehe meet saa777 that would be great- it makes me wanna come even more to know that- yalla get the turkish delight ready	10	2
55595	44831	Tue Jun 16 04:01:37 PDT 2009	@DigiGifts Was just an idea of the top of the old noggin	28	3
58753	4482	Tue Jun 16 05:18:25 PDT 2009	@DAREvolutionary all is well...I painted last night, and so did Nick...Our studio is functioning & Rusty & team are casting a feature	6	5

In [8]:
```
Literature<-read.csv("C:\\users\\user\\Literature.csv",stringsAsFactors=FALSE)
```

In [9]:
```
str(Literature)
Literature<-Literature[,c(1,2,4,5,6)]
Literature_text<- rbind(Literature)
```

```
'data.frame':   3135 obs. of  6 variables:
 $ userid    : int  12503 16266 16625 16194 10628 13449 18826 12966 18123 145
47 ...
 $ contentid : int  45322 446 4421 44413 44312 4482 443112 4451 451220 45322
...
 $ date      : chr  "Mon Apr 06 22:45:40 PDT 2009" "Mon Apr 06 23:01:15 PDT 2
009" "Mon Apr 06 23:21:30 PDT 2009" "Tue Apr 07 01:03:56 PDT 2009" ...
 $ text      : chr  "Bad news was Dad has cancer and is dying   Good news new
business started and  I am now a life coach practising"| __truncated__ "im lo
nely  keep me company! 22 female, new york" "Sad about Kutner being killed of
f my fav show House! " "is going to priceline (city) tomorrow, but lost her
'must haves' list " ...
 $ Topic.Code: int  12 12 20 5 29 16 20 15 31 2 ...
 $ rating    : int  2 3 4 2 1 5 4 5 2 3 ...
```

In [32]:
```
names(Literature_text)
dim(Literature_text)
```

'userid' 'contentid' 'text' 'Topic.Code' 'rating'

3135 5

In [34]:
```
#structure of Literature_text

str(Literature_text)
```

```
'data.frame':   3135 obs. of  5 variables:
 $ userid    : int  12503 16266 16625 16194 10628 13449 18826 12966 18123 145
47 ...
 $ contentid : int  45322 446 4421 44413 44312 4482 443112 4451 451220 45322
...
 $ text      : chr  "Bad news was Dad has cancer and is dying   Good news new
business started and  I am now a life coach practising"| __truncated__ "im lo
nely  keep me company! 22 female, new york" "Sad about Kutner being killed of
f my fav show House! " "is going to priceline (city) tomorrow, but lost her
'must haves' list " ...
 $ Topic.Code: int  12 12 20 5 29 16 20 15 31 2 ...
 $ rating    : int  2 3 4 2 1 5 4 5 2 3 ...
```

In [33]:
```
#exploratory analysis of the dataset

#Check if there are any missing values in the dataset
data1<- is.na(Literature_text)
data1
colSums(is.na(Literature_text))
```

userid	contentid	text	Topic.Code	rating
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
...	...	...	...	...
FALSE	FALSE	FALSE	FALSE	FALSE

userid	contentid	text	Topic.Code	rating
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE
FALSE	FALSE	FALSE	FALSE	FALSE

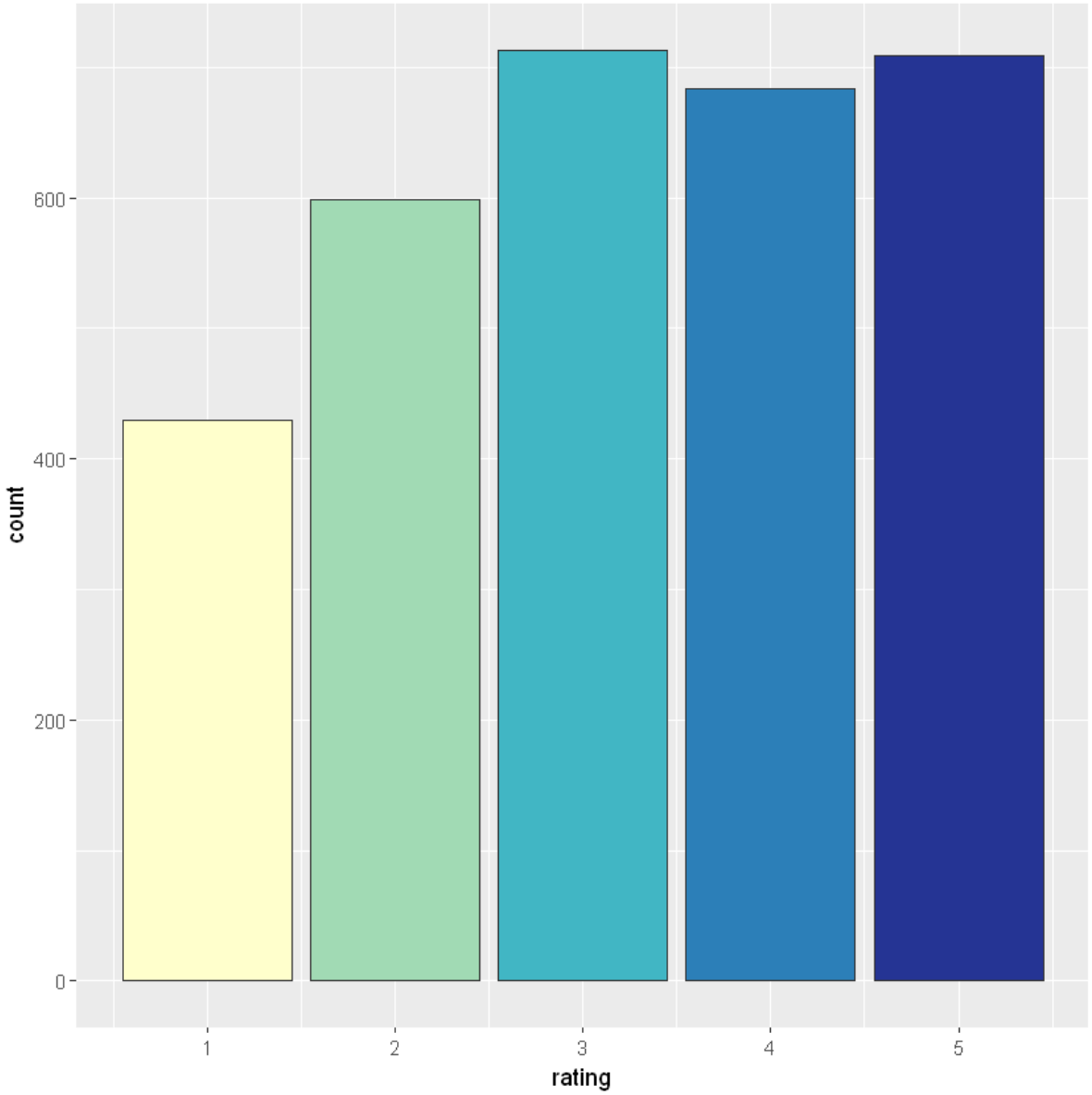
userid	0
contentid	0
text	0
Topic.Code	0
rating	0

In [35]:
```
install.packages("ggplot2")
```

```
Installing package into 'C:/Users/user/Documents/R/win-library/3.4'
(as 'lib' is unspecified)
Warning message:
"package 'ggplot2' is in use and will not be installed"
```

In [36]:
```
library(ggplot2)
```

In [37]:
```
#distribution of ratings
ggplot(Literature_text , aes(x = rating, fill = factor(rating))) +
  geom_bar(color = "grey20") + scale_fill_brewer(palette = "YlGnBu") + guides(
fill = FALSE)
```



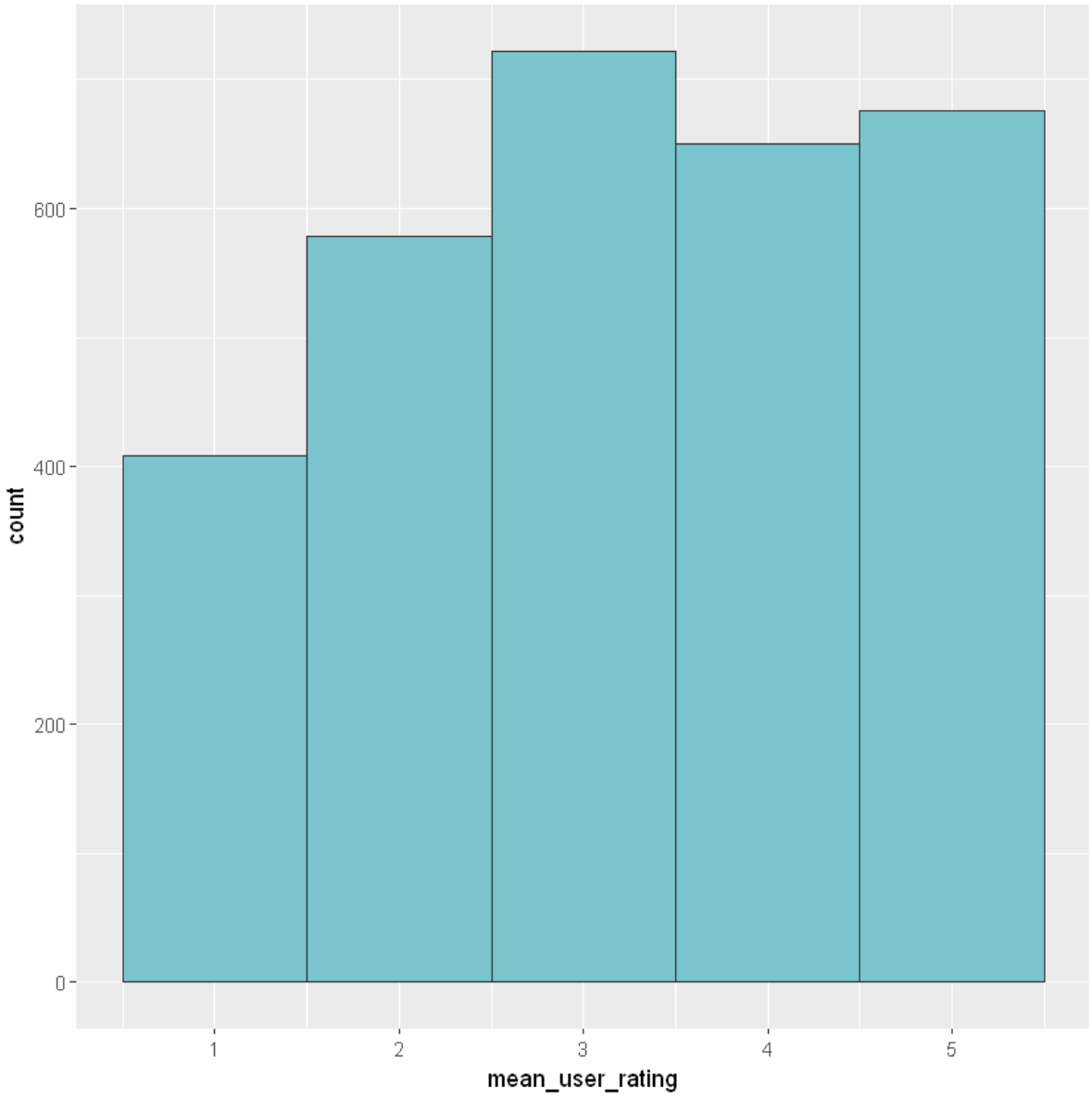
In [38]:
```
install.packages("dplyr")
```

```
Installing package into 'C:/Users/user/Documents/R/win-library/3.4'
(as 'lib' is unspecified)

package 'dplyr' successfully unpacked and MD5 sums checked

Warning message:
"cannot remove prior installation of package 'dplyr'"

The downloaded binary packages are in
        C:\Users\user\AppData\Local\Temp\RtmpaYdVuv\downloaded_packages
```

In [39]:
```
library(dplyr)
```

```
Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

    filter, lag

The following objects are masked from 'package:base':

    intersect, setdiff, setequal, union
```

In [40]:
```
#mean user rating
Literature_text %>%
  group_by(userid) %>%
  summarize(mean_user_rating = mean(rating)) %>%
  ggplot(aes(mean_user_rating)) +
  geom_histogram(bins= "5",fill = "cadetblue3", color = "grey20")
```



In [41]:
```
#analysis of the dataset
summary(Literature_text)
```

```
     userid        contentid          text             Topic.Code
 Min.   : 2598   Min.   :   446   Length:3135        Min.   : 1.00
 1st Qu.:21298   1st Qu.:  4451   Class :character   1st Qu.:12.00
 Median :32370   Median : 44412   Mode  :character   Median :16.00
 Mean   :32925   Mean   :100201                      Mean   :16.16
 3rd Qu.:43843   3rd Qu.: 45321                      3rd Qu.:20.00
 Max.   :97954   Max.   :451221                      Max.   :99.00
     rating
 Min.   :1.000
 1st Qu.:2.000
 Median :3.000
 Mean   :3.205
 3rd Qu.:4.000
 Max.   :5.000
```

In [48]:
```
#build a text corpus
#source for the corpus

Literature_text.corpus<-Corpus(VectorSource(Literature_text$text))

summary(Literature_text.corpus[1:5])
inspect(Literature_text.corpus[1:5])

#Data Transformations
Literature_text.corpus<-tm_map(Literature_text.corpus,tolower)
Literature_text.corpus<-tm_map(Literature_text.corpus,stripWhitespace)
Literature_text.corpus<-tm_map(Literature_text.corpus,removePunctuation)
Literature_text.corpus<-tm_map(Literature_text.corpus,removeNumbers)
```

```
  Length Class             Mode
1 2      PlainTextDocument list
2 2      PlainTextDocument list
3 2      PlainTextDocument list
4 2      PlainTextDocument list
5 2      PlainTextDocument list

<<SimpleCorpus>>
Metadata:  corpus specific: 1, document level (indexed): 0
Content:  documents: 5

[1] Bad news was Dad has cancer and is dying   Good news new business started
and  I am now a life coach practising holistic weight management
[2] im lonely  keep me company! 22 female, new york

[3] Sad about Kutner being killed off my fav show House!

[4] is going to priceline (city) tomorrow, but lost her 'must haves' list

[5] Difficulties with GTalk  Closing the Division for the day. Later, everyon
e.
```

In [62]:
```
Literature_text.corpus<- tm_map(Literature_text.corpus, removeWords, stopwords
('english'))
Literature_text.corpus<-tm_map(Literature_text.corpus,removeWords,my_stopwords
)
```

```
Warning message in read.dcf(file.path(p, "DESCRIPTION"), c("Package", "Versio
n")):
"cannot open compressed file 'C:/Users/user/Anaconda3/Lib/R/library/tm/DESCRI
PTION', probable reason 'No such file or directory'"
```

In [63]:
```
inspect(Literature_text.corpus[1:5])
```

```
<<SimpleCorpus>>
Metadata:  corpus specific: 1, document level (indexed): 0
Content:  documents: 5

[1] bad news  dad  cancer   dying good news new business started    now  life
coach practising holistic weight management
[2] im lonely keep  company female new york

[3] sad  kutner  killed   fav show house

[4]  going  priceline city tomorrow  lost  must haves list

[5] difficulties  gtalk closing  division   day later everyone
```

In [66]:
```
#building term document matrix
Literature_text.tdm<-TermDocumentMatrix(Literature_text.corpus)

#to show no of terms and documents
Literature_text.tdm
dim(Literature_text.tdm)#dim of term document matrix
inspect(Literature_text.tdm[1:10,1:10])
```

```
<<TermDocumentMatrix (terms: 8005, documents: 3135)>>
Non-/sparse entries: 22921/25072754
Sparsity           : 100%
Maximal term length: 46
Weighting          : term frequency (tf)
```

```
    8005  3135
```

```
<<TermDocumentMatrix (terms: 10, documents: 10)>>
Non-/sparse entries: 10/90
Sparsity           : 90%
Maximal term length: 10
Weighting          : term frequency (tf)
Sample             :
            Docs
Terms        1 10 2 3 4 5 6 7 8 9
  bad        1  0 0 0 0 0 0 0 0 0
  business   1  0 0 0 0 0 0 0 0 0
  cancer     1  0 0 0 0 0 0 0 0 0
  coach      1  0 0 0 0 0 0 0 0 0
  dad        1  0 0 0 0 0 0 0 0 0
  dying      1  0 0 0 0 0 0 0 0 0
  good       1  0 0 0 0 0 0 0 0 0
  holistic   1  0 0 0 0 0 0 0 0 0
  life       1  0 0 0 0 0 0 0 0 0
  management 1  0 0 0 0 0 0 0 0 0
```

In [67]:
```
#remove sparse terms(words that occur infrequently)
Literature_text.imp<-removeSparseTerms(Literature_text.tdm,0.97)
Literature_text.imp

inspect(Literature_text.imp[1:3,1:3])
```

```
<<TermDocumentMatrix (terms: 18, documents: 3135)>>
Non-/sparse entries: 2356/54074
Sparsity           : 96%
Maximal term length: 5
Weighting          : term frequency (tf)

<<TermDocumentMatrix (terms: 3, documents: 3)>>
Non-/sparse entries: 2/7
Sparsity           : 78%
Maximal term length: 5
Weighting          : term frequency (tf)
Sample             :
       Docs
Terms   1 2 3
  going 0 0 0
  good  1 0 0
  now   1 0 0
```

In [68]:
```
#finding words and frequencies

temp<-inspect(Literature_text.imp)

wordfreq<-data.frame(apply(temp,1,sum))

wordfreq<-data.frame(ST=row.names(wordfreq),freq = wordfreq[,1])

head(wordfreq)
```

```
<<TermDocumentMatrix (terms: 18, documents: 3135)>>
Non-/sparse entries: 2356/54074
Sparsity           : 96%
Maximal term length: 5
Weighting          : term frequency (tf)
Sample             :
       Docs
Terms   1413 1878 2006 281 290 632 634 799 854 989
  day      0    0    0   0   0   0   0   0   1   0
  dont     0    0    0   0   0   0   0   2   0   0
  get      1    0    0   0   1   2   0   1   0   0
  going    0    1    1   3   0   0   0   0   1   2
  good     0    0    0   0   0   0   0   1   1   0
  got      2    1    0   0   0   1   1   0   0   0
  just     0    1    0   0   0   1   0   0   0   0
  like     0    0    0   0   0   0   1   0   1   0
  now      0    1    1   0   0   1   0   1   1   0
  work     0    1    0   0   0   0   0   0   0   0
```

ST	freq
day	1
dont	2
get	5
going	8
good	2
got	5

In [69]:
```
wordfreq<-wordfreq[order(wordfreq$freq,decreasing=T),]
findFreqTerms(Literature_text.tdm,30)
```

'bad' 'good' 'new' 'now' 'sad' 'show' 'going' 'tomorrow' 'day' 'everyone' 'school' 'even' 'miss' 'though' 'will' 'work' 'home' 'long' 'morning' 'just' 'hope' 'sleep' 'soon' 'thank' 'still' 'great' 'think' 'well' 'guys' 'love' 'see' 'wish' 'got' 'last' 'night' 'today' 'need' 'back' 'fun' 'watching' 'yeah' 'amp' 'didnt' 'people' 'take' 'haha' 'lol' 'much' 'next' 'time' 'hate' 'dont' 'wait' 'thats' 'way' 'one' 'cant' 'bed' 'want' 'right' 'can' 'girl' 'like' 'better' 'get' 'weekend' 'feel' 'make' 'really' 'getting' 'week' 'gonna' 'sorry' 'twitter' 'ill' 'youre' 'days' 'omg' 'yes' 'awesome' 'know' 'done' 'looking' 'ive' 'sick' 'made' 'happy' 'nice' 'wanna' 'tonight' 'thanks' 'things' 'say' 'please' 'come'

In [70]:
```
#correalation value

findAssocs(Literature_text.tdm,"great",0.2)
findAssocs(Literature_text.tdm,"weekend",0.3)
findAssocs(Literature_text.tdm,"week",0.3)
```

$great =

healthy	0.25
attendees	0.23
lecture	0.23
den	0.23
haag	0.23
doctorquot	0.23
londongreat	0.23
opportunities	0.23

$weekend = crisette: 0.33

$week =

averaging	0.33
littlebitlil	0.33
zooey	0.33

In [53]:
```
install.packages("wordcloud",lib='C:/Users/user/Anaconda3/Lib/R/library',repos
='http://cran.us.r-project.org')
```

```
Warning message:
"package 'wordcloud' is in use and will not be installed"
```

In [16]:
```
install.packages("ggpolot2",lib = 'C:/Users/user/Anaconda3/Lib/R/library',repo
s='http://cran.us.r-project.org')
```

```
Warning message:
"package 'ggpolot2' is not available (for R version 3.4.3)"
```

In [17]:
```
install.packages("RColorBrewer")
```

```
Installing package into 'C:/Users/user/Documents/R/win-library/3.4'
(as 'lib' is unspecified)

package 'RColorBrewer' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
        C:\Users\user\AppData\Local\Temp\RtmpaYdVuv\downloaded_packages
```

In [20]:
```
library("wordcloud")
library("RColorBrewer")
```

```
Loading required package: RColorBrewer
```

In [21]:
```
library("wordcloud")
```

In [22]:
```
library("RColorBrewer")
```

In [23]:
```
wordcloud(Literature_text.corpus,min.freq=30,max.words=100,random.order=T,colo
rs=pal2)
```

```
Error in wordcloud(Literature_text.corpus, min.freq = 30, max.words = 100, :
object 'pal2' not found
Traceback:

1. wordcloud(Literature_text.corpus, min.freq = 30, max.words = 100,
 .     random.order = T, colors = pal2)
```

In [24]:
```
display.brewer.all()
brewer.pal
```

```
function (n, name)
{
    if (!(name %in% namelist)) {
        stop(paste(name, "is not a valid palette name for brewer.pal\n"))
    }
    if (n < 3) {
        warning("minimal value for n is 3, returning requested palette with 3
 different levels\n")
        return(brewer.pal(3, name))
    }
    if (n > maxcolors[which(name == namelist)]) {
        warning(paste("n too large, allowed maximum for palette",
            name, "is", maxcolors[which(name == namelist)]),
            "\nReturning the palette you asked for with that many colors\n")
        return(brewer.pal(maxcolors[which(name == namelist)],
            name))
    }
    switch(name, Accent = switch(n - 2, rgb(c(127, 190, 253),
        c(201, 174, 192), c(127, 212, 134), maxColorValue = 255),
        rgb(c(127, 190, 253, 255), c(201, 174, 192, 255), c(127,
            212, 134, 153), maxColorValue = 255), rgb(c(127,
            190, 253, 255, 56), c(201, 174, 192, 255, 108), c(127,
            212, 134, 153, 176), maxColorValue = 255), rgb(c(127,
            190, 253, 255, 56, 240), c(201, 174, 192, 255, 108,
            2), c(127, 212, 134, 153, 176, 127), maxColorValue = 255),
        rgb(c(127, 190, 253, 255, 56, 240, 191), c(201, 174,
            192, 255, 108, 2, 91), c(127, 212, 134, 153, 176,
            127, 23), maxColorValue = 255), rgb(c(127, 190, 253,
            255, 56, 240, 191, 102), c(201, 174, 192, 255, 108,
            2, 91, 102), c(127, 212, 134, 153, 176, 127, 23,
            102), maxColorValue = 255)), Blues = switch(n - 2,
        rgb(c(222, 158, 49), c(235, 202, 130), c(247, 225, 189),
            maxColorValue = 255), rgb(c(239, 189, 107, 33), c(243,
            215, 174, 113), c(255, 231, 214, 181), maxColorValue = 255),
        rgb(c(239, 189, 107, 49, 8), c(243, 215, 174, 130, 81),
            c(255, 231, 214, 189, 156), maxColorValue = 255),
        rgb(c(239, 198, 158, 107, 49, 8), c(243, 219, 202, 174,
            130, 81), c(255, 239, 225, 214, 189, 156), maxColorValue = 255),
        rgb(c(239, 198, 158, 107, 66, 33, 8), c(243, 219, 202,
            174, 146, 113, 69), c(255, 239, 225, 214, 198, 181,
            148), maxColorValue = 255), rgb(c(247, 222, 198,
            158, 107, 66, 33, 8), c(251, 235, 219, 202, 174,
            146, 113, 69), c(255, 247, 239, 225, 214, 198, 181,
            148), maxColorValue = 255), rgb(c(247, 222, 198,
            158, 107, 66, 33, 8, 8), c(251, 235, 219, 202, 174,
            146, 113, 81, 48), c(255, 247, 239, 225, 214, 198,
            181, 156, 107), maxColorValue = 255)), BrBG = switch(n -
        2, rgb(c(216, 245, 90), c(179, 245, 180), c(101, 245,
```

```
            172), maxColorValue = 255), rgb(c(166, 223, 128, 1),
            c(97, 194, 205, 133), c(26, 125, 193, 113), maxColorValue = 255),
            rgb(c(166, 223, 245, 128, 1), c(97, 194, 245, 205, 133),
                c(26, 125, 245, 193, 113), maxColorValue = 255),
            rgb(c(140, 216, 246, 199, 90, 1), c(81, 179, 232, 234,
                180, 102), c(10, 101, 195, 229, 172, 94), maxColorValue = 255),
            rgb(c(140, 216, 246, 245, 199, 90, 1), c(81, 179, 232,
                245, 234, 180, 102), c(10, 101, 195, 245, 229, 172,
                94), maxColorValue = 255), rgb(c(140, 191, 223, 246,
                199, 128, 53, 1), c(81, 129, 194, 232, 234, 205,
                151, 102), c(10, 45, 125, 195, 229, 193, 143, 94),
                maxColorValue = 255), rgb(c(140, 191, 223, 246, 245,
                199, 128, 53, 1), c(81, 129, 194, 232, 245, 234,
                205, 151, 102), c(10, 45, 125, 195, 245, 229, 193,
                143, 94), maxColorValue = 255), rgb(c(84, 140, 191,
                223, 246, 199, 128, 53, 1, 0), c(48, 81, 129, 194,
                232, 234, 205, 151, 102, 60), c(5, 10, 45, 125, 195,
                229, 193, 143, 94, 48), maxColorValue = 255), rgb(c(84,
                140, 191, 223, 246, 245, 199, 128, 53, 1, 0), c(48,
                81, 129, 194, 232, 245, 234, 205, 151, 102, 60),
                c(5, 10, 45, 125, 195, 245, 229, 193, 143, 94, 48),
                maxColorValue = 255)), BuGn = switch(n - 2, rgb(c(229,
            153, 44), c(245, 216, 162), c(249, 201, 95), maxColorValue = 255),
            rgb(c(237, 178, 102, 35), c(248, 226, 194, 139), c(251,
                226, 164, 69), maxColorValue = 255), rgb(c(237, 178,
                102, 44, 0), c(248, 226, 194, 162, 109), c(251, 226,
                164, 95, 44), maxColorValue = 255), rgb(c(237, 204,
                153, 102, 44, 0), c(248, 236, 216, 194, 162, 109),
                c(251, 230, 201, 164, 95, 44), maxColorValue = 255),
            rgb(c(237, 204, 153, 102, 65, 35, 0), c(248, 236, 216,
                194, 174, 139, 88), c(251, 230, 201, 164, 118, 69,
                36), maxColorValue = 255), rgb(c(247, 229, 204, 153,
                102, 65, 35, 0), c(252, 245, 236, 216, 194, 174,
                139, 88), c(253, 249, 230, 201, 164, 118, 69, 36),
                maxColorValue = 255), rgb(c(247, 229, 204, 153, 102,
                65, 35, 0, 0), c(252, 245, 236, 216, 194, 174, 139,
                109, 68), c(253, 249, 230, 201, 164, 118, 69, 44,
                27), maxColorValue = 255)), BuPu = switch(n - 2,
            rgb(c(224, 158, 136), c(236, 188, 86), c(244, 218, 167),
                maxColorValue = 255), rgb(c(237, 179, 140, 136),
                c(248, 205, 150, 65), c(251, 227, 198, 157), maxColorValue = 25
    5),
            rgb(c(237, 179, 140, 136, 129), c(248, 205, 150, 86,
                15), c(251, 227, 198, 167, 124), maxColorValue = 255),
            rgb(c(237, 191, 158, 140, 136, 129), c(248, 211, 188,
                150, 86, 15), c(251, 230, 218, 198, 167, 124), maxColorValue = 25
    5),
            rgb(c(237, 191, 158, 140, 140, 136, 110), c(248, 211,
                188, 150, 107, 65, 1), c(251, 230, 218, 198, 177,
```

```
    157, 107), maxColorValue = 255), rgb(c(247, 224,
    191, 158, 140, 140, 136, 110), c(252, 236, 211, 188,
    150, 107, 65, 1), c(253, 244, 230, 218, 198, 177,
    157, 107), maxColorValue = 255), rgb(c(247, 224,
    191, 158, 140, 140, 136, 129, 77), c(252, 236, 211,
    188, 150, 107, 65, 15, 0), c(253, 244, 230, 218,
    198, 177, 157, 124, 75), maxColorValue = 255)), Dark2 = switch(n
-
2, rgb(c(27, 217, 117), c(158, 95, 112), c(119, 2, 179),
maxColorValue = 255), rgb(c(27, 217, 117, 231), c(158,
95, 112, 41), c(119, 2, 179, 138), maxColorValue = 255),
rgb(c(27, 217, 117, 231, 102), c(158, 95, 112, 41, 166),
    c(119, 2, 179, 138, 30), maxColorValue = 255), rgb(c(27,
    217, 117, 231, 102, 230), c(158, 95, 112, 41, 166,
    171), c(119, 2, 179, 138, 30, 2), maxColorValue = 255),
rgb(c(27, 217, 117, 231, 102, 230, 166), c(158, 95, 112,
    41, 166, 171, 118), c(119, 2, 179, 138, 30, 2, 29),
    maxColorValue = 255), rgb(c(27, 217, 117, 231, 102,
    230, 166, 102), c(158, 95, 112, 41, 166, 171, 118,
    102), c(119, 2, 179, 138, 30, 2, 29, 102), maxColorValue = 255)),

GnBu = switch(n - 2, rgb(c(224, 168, 67), c(243, 221,
    162), c(219, 181, 202), maxColorValue = 255), rgb(c(240,
    186, 123, 43), c(249, 228, 204, 140), c(232, 188,
    196, 190), maxColorValue = 255), rgb(c(240, 186,
    123, 67, 8), c(249, 228, 204, 162, 104), c(232, 188,
    196, 202, 172), maxColorValue = 255), rgb(c(240,
    204, 168, 123, 67, 8), c(249, 235, 221, 204, 162,
    104), c(232, 197, 181, 196, 202, 172), maxColorValue = 255),
    rgb(c(240, 204, 168, 123, 78, 43, 8), c(249, 235,
        221, 204, 179, 140, 88), c(232, 197, 181, 196,
        211, 190, 158), maxColorValue = 255), rgb(c(247,
        224, 204, 168, 123, 78, 43, 8), c(252, 243, 235,
        221, 204, 179, 140, 88), c(240, 219, 197, 181,
        196, 211, 190, 158), maxColorValue = 255), rgb(c(247,
        224, 204, 168, 123, 78, 43, 8, 8), c(252, 243,
        235, 221, 204, 179, 140, 104, 64), c(240, 219,
        197, 181, 196, 211, 190, 172, 129), maxColorValue = 255)),
Greens = switch(n - 2, rgb(c(229, 161, 49), c(245, 217,
    163), c(224, 155, 84), maxColorValue = 255), rgb(c(237,
    186, 116, 35), c(248, 228, 196, 139), c(233, 179,
    118, 69), maxColorValue = 255), rgb(c(237, 186, 116,
    49, 0), c(248, 228, 196, 163, 109), c(233, 179, 118,
    84, 44), maxColorValue = 255), rgb(c(237, 199, 161,
    116, 49, 0), c(248, 233, 217, 196, 163, 109), c(233,
    192, 155, 118, 84, 44), maxColorValue = 255), rgb(c(237,
    199, 161, 116, 65, 35, 0), c(248, 233, 217, 196,
    171, 139, 90), c(233, 192, 155, 118, 93, 69, 50),
    maxColorValue = 255), rgb(c(247, 229, 199, 161, 116,
```

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                65, 35, 0), c(252, 245, 233, 217, 196, 171, 139,
                90), c(245, 224, 192, 155, 118, 93, 69, 50), maxColorValue = 25
5),
                rgb(c(247, 229, 199, 161, 116, 65, 35, 0, 0), c(252,
                    245, 233, 217, 196, 171, 139, 109, 68), c(245,
                    224, 192, 155, 118, 93, 69, 44, 27), maxColorValue = 255)),
            Greys = switch(n - 2, rgb(c(240, 189, 99), c(240, 189,
                99), c(240, 189, 99), maxColorValue = 255), rgb(c(247,
                204, 150, 82), c(247, 204, 150, 82), c(247, 204,
                150, 82), maxColorValue = 255), rgb(c(247, 204, 150,
                99, 37), c(247, 204, 150, 99, 37), c(247, 204, 150,
                99, 37), maxColorValue = 255), rgb(c(247, 217, 189,
                150, 99, 37), c(247, 217, 189, 150, 99, 37), c(247,
                217, 189, 150, 99, 37), maxColorValue = 255), rgb(c(247,
                217, 189, 150, 115, 82, 37), c(247, 217, 189, 150,
                115, 82, 37), c(247, 217, 189, 150, 115, 82, 37),
                maxColorValue = 255), rgb(c(255, 240, 217, 189, 150,
                115, 82, 37), c(255, 240, 217, 189, 150, 115, 82,
                37), c(255, 240, 217, 189, 150, 115, 82, 37), maxColorValue = 25
5),
                rgb(c(255, 240, 217, 189, 150, 115, 82, 37, 0), c(255,
                    240, 217, 189, 150, 115, 82, 37, 0), c(255, 240,
                    217, 189, 150, 115, 82, 37, 0), maxColorValue = 255)),
            Oranges = switch(n - 2, rgb(c(254, 253, 230), c(230,
                174, 85), c(206, 107, 13), maxColorValue = 255),
                rgb(c(254, 253, 253, 217), c(237, 190, 141, 71),
                    c(222, 133, 60, 1), maxColorValue = 255), rgb(c(254,
                    253, 253, 230, 166), c(237, 190, 141, 85, 54),
                    c(222, 133, 60, 13, 3), maxColorValue = 255),
                rgb(c(254, 253, 253, 253, 230, 166), c(237, 208,
                    174, 141, 85, 54), c(222, 162, 107, 60, 13, 3),
                    maxColorValue = 255), rgb(c(254, 253, 253, 253,
                    241, 217, 140), c(237, 208, 174, 141, 105, 72,
                    45), c(222, 162, 107, 60, 19, 1, 4), maxColorValue = 255),
                rgb(c(255, 254, 253, 253, 253, 241, 217, 140), c(245,
                    230, 208, 174, 141, 105, 72, 45), c(235, 206,
                    162, 107, 60, 19, 1, 4), maxColorValue = 255),
                rgb(c(255, 254, 253, 253, 253, 241, 217, 166, 127),
                    c(245, 230, 208, 174, 141, 105, 72, 54, 39),
                    c(235, 206, 162, 107, 60, 19, 1, 3, 4), maxColorValue = 25
5)),
            OrRd = switch(n - 2, rgb(c(254, 253, 227), c(232, 187,
                74), c(200, 132, 51), maxColorValue = 255), rgb(c(254,
                253, 252, 215), c(240, 204, 141, 48), c(217, 138,
                89, 31), maxColorValue = 255), rgb(c(254, 253, 252,
                227, 179), c(240, 204, 141, 74, 0), c(217, 138, 89,
                51, 0), maxColorValue = 255), rgb(c(254, 253, 253,
                252, 227, 179), c(240, 212, 187, 141, 74, 0), c(217,
                158, 132, 89, 51, 0), maxColorValue = 255), rgb(c(254,
```

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                253, 253, 252, 239, 215, 153), c(240, 212, 187, 141,
                101, 48, 0), c(217, 158, 132, 89, 72, 31, 0), maxColorValue = 25
5),
                rgb(c(255, 254, 253, 253, 252, 239, 215, 153), c(247,
                    232, 212, 187, 141, 101, 48, 0), c(236, 200,
                    158, 132, 89, 72, 31, 0), maxColorValue = 255),
                rgb(c(255, 254, 253, 253, 252, 239, 215, 179, 127),
                    c(247, 232, 212, 187, 141, 101, 48, 0, 0), c(236,
                      200, 158, 132, 89, 72, 31, 0, 0), maxColorValue = 255)),
            Paired = switch(n - 2, rgb(c(166, 31, 178), c(206, 120,
                223), c(227, 180, 138), maxColorValue = 255), rgb(c(166,
                31, 178, 51), c(206, 120, 223, 160), c(227, 180,
                138, 44), maxColorValue = 255), rgb(c(166, 31, 178,
                51, 251), c(206, 120, 223, 160, 154), c(227, 180,
                138, 44, 153), maxColorValue = 255), rgb(c(166, 31,
                178, 51, 251, 227), c(206, 120, 223, 160, 154, 26),
                c(227, 180, 138, 44, 153, 28), maxColorValue = 255),
                rgb(c(166, 31, 178, 51, 251, 227, 253), c(206, 120,
                    223, 160, 154, 26, 191), c(227, 180, 138, 44,
                    153, 28, 111), maxColorValue = 255), rgb(c(166,
                    31, 178, 51, 251, 227, 253, 255), c(206, 120,
                    223, 160, 154, 26, 191, 127), c(227, 180, 138,
                    44, 153, 28, 111, 0), maxColorValue = 255), rgb(c(166,
                    31, 178, 51, 251, 227, 253, 255, 202), c(206,
                    120, 223, 160, 154, 26, 191, 127, 178), c(227,
                    180, 138, 44, 153, 28, 111, 0, 214), maxColorValue = 255),
                rgb(c(166, 31, 178, 51, 251, 227, 253, 255, 202,
                    106), c(206, 120, 223, 160, 154, 26, 191, 127,
                    178, 61), c(227, 180, 138, 44, 153, 28, 111,
                    0, 214, 154), maxColorValue = 255), rgb(c(166,
                    31, 178, 51, 251, 227, 253, 255, 202, 106, 255),
                    c(206, 120, 223, 160, 154, 26, 191, 127, 178,
                      61, 255), c(227, 180, 138, 44, 153, 28, 111,
                      0, 214, 154, 153), maxColorValue = 255), rgb(c(166,
                    31, 178, 51, 251, 227, 253, 255, 202, 106, 255,
                    177), c(206, 120, 223, 160, 154, 26, 191, 127,
                    178, 61, 255, 89), c(227, 180, 138, 44, 153,
                    28, 111, 0, 214, 154, 153, 40), maxColorValue = 255)),
            Pastel1 = switch(n - 2, rgb(c(251, 179, 204), c(180,
                205, 235), c(174, 227, 197), maxColorValue = 255),
                rgb(c(251, 179, 204, 222), c(180, 205, 235, 203),
                    c(174, 227, 197, 228), maxColorValue = 255),
                rgb(c(251, 179, 204, 222, 254), c(180, 205, 235,
                    203, 217), c(174, 227, 197, 228, 166), maxColorValue = 255),
                rgb(c(251, 179, 204, 222, 254, 255), c(180, 205,
                    235, 203, 217, 255), c(174, 227, 197, 228, 166,
                    204), maxColorValue = 255), rgb(c(251, 179, 204,
                    222, 254, 255, 229), c(180, 205, 235, 203, 217,
                    255, 216), c(174, 227, 197, 228, 166, 204, 189),
```

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                    maxColorValue = 255), rgb(c(251, 179, 204, 222,
                    254, 255, 229, 253), c(180, 205, 235, 203, 217,
                    255, 216, 218), c(174, 227, 197, 228, 166, 204,
                    189, 236), maxColorValue = 255), rgb(c(251, 179,
                    204, 222, 254, 255, 229, 253, 242), c(180, 205,
                    235, 203, 217, 255, 216, 218, 242), c(174, 227,
                    197, 228, 166, 204, 189, 236, 242), maxColorValue = 255)),
                Pastel2 = switch(n - 2, rgb(c(179, 253, 203), c(226,
                    205, 213), c(205, 172, 232), maxColorValue = 255),
                    rgb(c(179, 253, 203, 244), c(226, 205, 213, 202),
                        c(205, 172, 232, 228), maxColorValue = 255),
                    rgb(c(179, 253, 203, 244, 230), c(226, 205, 213,
                        202, 245), c(205, 172, 232, 228, 201), maxColorValue = 255),
                    rgb(c(179, 253, 203, 244, 230, 255), c(226, 205,
                        213, 202, 245, 242), c(205, 172, 232, 228, 201,
                        174), maxColorValue = 255), rgb(c(179, 253, 203,
                        244, 230, 255, 241), c(226, 205, 213, 202, 245,
                        242, 226), c(205, 172, 232, 228, 201, 174, 204),
                        maxColorValue = 255), rgb(c(179, 253, 203, 244,
                        230, 255, 241, 204), c(226, 205, 213, 202, 245,
                        242, 226, 204), c(205, 172, 232, 228, 201, 174,
                        204, 204), maxColorValue = 255)), PiYG = switch(n -
                    2, rgb(c(233, 247, 161), c(163, 247, 215), c(201,
                    247, 106), maxColorValue = 255), rgb(c(208, 241,
                    184, 77), c(28, 182, 225, 172), c(139, 218, 134,
                    38), maxColorValue = 255), rgb(c(208, 241, 247, 184,
                    77), c(28, 182, 247, 225, 172), c(139, 218, 247,
                    134, 38), maxColorValue = 255), rgb(c(197, 233, 253,
                    230, 161, 77), c(27, 163, 224, 245, 215, 146), c(125,
                    201, 239, 208, 106, 33), maxColorValue = 255), rgb(c(197,
                    233, 253, 247, 230, 161, 77), c(27, 163, 224, 247,
                    245, 215, 146), c(125, 201, 239, 247, 208, 106, 33),
                    maxColorValue = 255), rgb(c(197, 222, 241, 253, 230,
                    184, 127, 77), c(27, 119, 182, 224, 245, 225, 188,
                    146), c(125, 174, 218, 239, 208, 134, 65, 33), maxColorValue = 25
5),
                    rgb(c(197, 222, 241, 253, 247, 230, 184, 127, 77),
                        c(27, 119, 182, 224, 247, 245, 225, 188, 146),
                        c(125, 174, 218, 239, 247, 208, 134, 65, 33),
                        maxColorValue = 255), rgb(c(142, 197, 222, 241,
                        253, 230, 184, 127, 77, 39), c(1, 27, 119, 182,
                        224, 245, 225, 188, 146, 100), c(82, 125, 174,
                        218, 239, 208, 134, 65, 33, 25), maxColorValue = 255),
                    rgb(c(142, 197, 222, 241, 253, 247, 230, 184, 127,
                        77, 39), c(1, 27, 119, 182, 224, 247, 245, 225,
                        188, 146, 100), c(82, 125, 174, 218, 239, 247,
                        208, 134, 65, 33, 25), maxColorValue = 255)),
                PRGn = switch(n - 2, rgb(c(175, 247, 127), c(141, 247,
                    191), c(195, 247, 123), maxColorValue = 255), rgb(c(123,
```

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                    194, 166, 0), c(50, 165, 219, 136), c(148, 207, 160,
                    55), maxColorValue = 255), rgb(c(123, 194, 247, 166,
                    0), c(50, 165, 247, 219, 136), c(148, 207, 247, 160,
                    55), maxColorValue = 255), rgb(c(118, 175, 231, 217,
                    127, 27), c(42, 141, 212, 240, 191, 120), c(131,
                    195, 232, 211, 123, 55), maxColorValue = 255), rgb(c(118,
                    175, 231, 247, 217, 127, 27), c(42, 141, 212, 247,
                    240, 191, 120), c(131, 195, 232, 247, 211, 123, 55),
                    maxColorValue = 255), rgb(c(118, 153, 194, 231, 217,
                    166, 90, 27), c(42, 112, 165, 212, 240, 219, 174,
                    120), c(131, 171, 207, 232, 211, 160, 97, 55), maxColorValue = 25
5),
                    rgb(c(118, 153, 194, 231, 247, 217, 166, 90, 27),
                        c(42, 112, 165, 212, 247, 240, 219, 174, 120),
                        c(131, 171, 207, 232, 247, 211, 160, 97, 55),
                        maxColorValue = 255), rgb(c(64, 118, 153, 194,
                        231, 217, 166, 90, 27, 0), c(0, 42, 112, 165,
                        212, 240, 219, 174, 120, 68), c(75, 131, 171,
                        207, 232, 211, 160, 97, 55, 27), maxColorValue = 255),
                    rgb(c(64, 118, 153, 194, 231, 247, 217, 166, 90,
                        27, 0), c(0, 42, 112, 165, 212, 247, 240, 219,
                        174, 120, 68), c(75, 131, 171, 207, 232, 247,
                        211, 160, 97, 55, 27), maxColorValue = 255)),
                PuBu = switch(n - 2, rgb(c(236, 166, 43), c(231, 189,
                    140), c(242, 219, 190), maxColorValue = 255), rgb(c(241,
                    189, 116, 5), c(238, 201, 169, 112), c(246, 225,
                    207, 176), maxColorValue = 255), rgb(c(241, 189,
                    116, 43, 4), c(238, 201, 169, 140, 90), c(246, 225,
                    207, 190, 141), maxColorValue = 255), rgb(c(241,
                    208, 166, 116, 43, 4), c(238, 209, 189, 169, 140,
                    90), c(246, 230, 219, 207, 190, 141), maxColorValue = 255),
                    rgb(c(241, 208, 166, 116, 54, 5, 3), c(238, 209,
                        189, 169, 144, 112, 78), c(246, 230, 219, 207,
                        192, 176, 123), maxColorValue = 255), rgb(c(255,
                        236, 208, 166, 116, 54, 5, 3), c(247, 231, 209,
                        189, 169, 144, 112, 78), c(251, 242, 230, 219,
                        207, 192, 176, 123), maxColorValue = 255), rgb(c(255,
                        236, 208, 166, 116, 54, 5, 4, 2), c(247, 231,
                        209, 189, 169, 144, 112, 90, 56), c(251, 242,
                        230, 219, 207, 192, 176, 141, 88), maxColorValue = 255)),
                PuBuGn = switch(n - 2, rgb(c(236, 166, 28), c(226, 189,
                    144), c(240, 219, 153), maxColorValue = 255), rgb(c(246,
                    189, 103, 2), c(239, 201, 169, 129), c(247, 225,
                    207, 138), maxColorValue = 255), rgb(c(246, 189,
                    103, 28, 1), c(239, 201, 169, 144, 108), c(247, 225,
                    207, 153, 89), maxColorValue = 255), rgb(c(246, 208,
                    166, 103, 28, 1), c(239, 209, 189, 169, 144, 108),
                    c(247, 230, 219, 207, 153, 89), maxColorValue = 255),
                    rgb(c(246, 208, 166, 103, 54, 2, 1), c(239, 209,
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                    189, 169, 144, 129, 100), c(247, 230, 219, 207,
                    192, 138, 80), maxColorValue = 255), rgb(c(255,
                    236, 208, 166, 103, 54, 2, 1), c(247, 226, 209,
                    189, 169, 144, 129, 100), c(251, 240, 230, 219,
                    207, 192, 138, 80), maxColorValue = 255), rgb(c(255,
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                    209, 189, 169, 144, 129, 108, 70), c(251, 240,
                    230, 219, 207, 192, 138, 89, 54), maxColorValue = 255)),
                PuOr = switch(n - 2, rgb(c(241, 247, 153), c(163, 247,
                    142), c(64, 247, 195), maxColorValue = 255), rgb(c(230,
                    253, 178, 94), c(97, 184, 171, 60), c(1, 99, 210,
                    153), maxColorValue = 255), rgb(c(230, 253, 247,
                    178, 94), c(97, 184, 247, 171, 60), c(1, 99, 247,
                    210, 153), maxColorValue = 255), rgb(c(179, 241,
                    254, 216, 153, 84), c(88, 163, 224, 218, 142, 39),
                    c(6, 64, 182, 235, 195, 136), maxColorValue = 255),
                    rgb(c(179, 241, 254, 247, 216, 153, 84), c(88, 163,
                        224, 247, 218, 142, 39), c(6, 64, 182, 247, 235,
                        195, 136), maxColorValue = 255), rgb(c(179, 224,
                        253, 254, 216, 178, 128, 84), c(88, 130, 184,
                        224, 218, 171, 115, 39), c(6, 20, 99, 182, 235,
                        210, 172, 136), maxColorValue = 255), rgb(c(179,
                        224, 253, 254, 247, 216, 178, 128, 84), c(88,
                        130, 184, 224, 247, 218, 171, 115, 39), c(6,
                        20, 99, 182, 247, 235, 210, 172, 136), maxColorValue = 255),
                    rgb(c(127, 179, 224, 253, 254, 216, 178, 128, 84,
                        45), c(59, 88, 130, 184, 224, 218, 171, 115,
                        39, 0), c(8, 6, 20, 99, 182, 235, 210, 172, 136,
                        75), maxColorValue = 255), rgb(c(127, 179, 224,
                        253, 254, 247, 216, 178, 128, 84, 45), c(59,
                        88, 130, 184, 224, 247, 218, 171, 115, 39, 0),
                        c(8, 6, 20, 99, 182, 247, 235, 210, 172, 136,
                          75), maxColorValue = 255)), PuRd = switch(n -
                    2, rgb(c(231, 201, 221), c(225, 148, 28), c(239,
                    199, 119), maxColorValue = 255), rgb(c(241, 215,
                    223, 206), c(238, 181, 101, 18), c(246, 216, 176,
                    86), maxColorValue = 255), rgb(c(241, 215, 223, 221,
                    152), c(238, 181, 101, 28, 0), c(246, 216, 176, 119,
                    67), maxColorValue = 255), rgb(c(241, 212, 201, 223,
                    221, 152), c(238, 185, 148, 101, 28, 0), c(246, 218,
                    199, 176, 119, 67), maxColorValue = 255), rgb(c(241,
                    212, 201, 223, 231, 206, 145), c(238, 185, 148, 101,
                    41, 18, 0), c(246, 218, 199, 176, 138, 86, 63), maxColorValue = 2
55),
                    rgb(c(247, 231, 212, 201, 223, 231, 206, 145), c(244,
                        225, 185, 148, 101, 41, 18, 0), c(249, 239, 218,
                        199, 176, 138, 86, 63), maxColorValue = 255),
                    rgb(c(247, 231, 212, 201, 223, 231, 206, 152, 103),
                        c(244, 225, 185, 148, 101, 41, 18, 0, 0), c(249,
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                    239, 218, 199, 176, 138, 86, 67, 31), maxColorValue = 25
5)),
        Purples = switch(n - 2, rgb(c(239, 188, 117), c(237,
            189, 107), c(245, 220, 177), maxColorValue = 255),
            rgb(c(242, 203, 158, 106), c(240, 201, 154, 81),
                c(247, 226, 200, 163), maxColorValue = 255),
            rgb(c(242, 203, 158, 117, 84), c(240, 201, 154, 107,
                39), c(247, 226, 200, 177, 143), maxColorValue = 255),
            rgb(c(242, 218, 188, 158, 117, 84), c(240, 218, 189,
                154, 107, 39), c(247, 235, 220, 200, 177, 143),
                maxColorValue = 255), rgb(c(242, 218, 188, 158,
                128, 106, 74), c(240, 218, 189, 154, 125, 81,
                20), c(247, 235, 220, 200, 186, 163, 134), maxColorValue = 25
5),
            rgb(c(252, 239, 218, 188, 158, 128, 106, 74), c(251,
                237, 218, 189, 154, 125, 81, 20), c(253, 245,
                235, 220, 200, 186, 163, 134), maxColorValue = 255),
            rgb(c(252, 239, 218, 188, 158, 128, 106, 84, 63),
                c(251, 237, 218, 189, 154, 125, 81, 39, 0), c(253,
                  245, 235, 220, 200, 186, 163, 143, 125), maxColorValue = 25
5)),
        RdBu = switch(n - 2, rgb(c(239, 247, 103), c(138, 247,
            169), c(98, 247, 207), maxColorValue = 255), rgb(c(202,
            244, 146, 5), c(0, 165, 197, 113), c(32, 130, 222,
            176), maxColorValue = 255), rgb(c(202, 244, 247,
            146, 5), c(0, 165, 247, 197, 113), c(32, 130, 247,
            222, 176), maxColorValue = 255), rgb(c(178, 239,
            253, 209, 103, 33), c(24, 138, 219, 229, 169, 102),
            c(43, 98, 199, 240, 207, 172), maxColorValue = 255),
            rgb(c(178, 239, 253, 247, 209, 103, 33), c(24, 138,
                219, 247, 229, 169, 102), c(43, 98, 199, 247,
                240, 207, 172), maxColorValue = 255), rgb(c(178,
                214, 244, 253, 209, 146, 67, 33), c(24, 96, 165,
                219, 229, 197, 147, 102), c(43, 77, 130, 199,
                240, 222, 195, 172), maxColorValue = 255), rgb(c(178,
                214, 244, 253, 247, 209, 146, 67, 33), c(24,
                96, 165, 219, 247, 229, 197, 147, 102), c(43,
                77, 130, 199, 247, 240, 222, 195, 172), maxColorValue = 255),

            rgb(c(103, 178, 214, 244, 253, 209, 146, 67, 33,
                5), c(0, 24, 96, 165, 219, 229, 197, 147, 102,
                48), c(31, 43, 77, 130, 199, 240, 222, 195, 172,
                97), maxColorValue = 255), rgb(c(103, 178, 214,
                244, 253, 247, 209, 146, 67, 33, 5), c(0, 24,
                96, 165, 219, 247, 229, 197, 147, 102, 48), c(31,
                43, 77, 130, 199, 247, 240, 222, 195, 172, 97),
                maxColorValue = 255)), RdGy = switch(n - 2, rgb(c(239,
            255, 153), c(138, 255, 153), c(98, 255, 153), maxColorValue = 25
5),
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            rgb(c(202, 244, 186, 64), c(0, 165, 186, 64), c(32,
                130, 186, 64), maxColorValue = 255), rgb(c(202,
                244, 255, 186, 64), c(0, 165, 255, 186, 64),
                c(32, 130, 255, 186, 64), maxColorValue = 255),
            rgb(c(178, 239, 253, 224, 153, 77), c(24, 138, 219,
                224, 153, 77), c(43, 98, 199, 224, 153, 77),
                maxColorValue = 255), rgb(c(178, 239, 253, 255,
                224, 153, 77), c(24, 138, 219, 255, 224, 153,
                77), c(43, 98, 199, 255, 224, 153, 77), maxColorValue = 255),

            rgb(c(178, 214, 244, 253, 224, 186, 135, 77), c(24,
                96, 165, 219, 224, 186, 135, 77), c(43, 77, 130,
                199, 224, 186, 135, 77), maxColorValue = 255),
            rgb(c(178, 214, 244, 253, 255, 224, 186, 135, 77),
                c(24, 96, 165, 219, 255, 224, 186, 135, 77),
                c(43, 77, 130, 199, 255, 224, 186, 135, 77),
                maxColorValue = 255), rgb(c(103, 178, 214, 244,
                253, 224, 186, 135, 77, 26), c(0, 24, 96, 165,
                219, 224, 186, 135, 77, 26), c(31, 43, 77, 130,
                199, 224, 186, 135, 77, 26), maxColorValue = 255),
            rgb(c(103, 178, 214, 244, 253, 255, 224, 186, 135,
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                135, 77, 26), c(31, 43, 77, 130, 199, 255, 224,
                186, 135, 77, 26), maxColorValue = 255)), RdPu = switch(n -
            2, rgb(c(253, 250, 197), c(224, 159, 27), c(221,
            181, 138), maxColorValue = 255), rgb(c(254, 251,
            247, 174), c(235, 180, 104, 1), c(226, 185, 161,
            126), maxColorValue = 255), rgb(c(254, 251, 247,
            197, 122), c(235, 180, 104, 27, 1), c(226, 185, 161,
            138, 119), maxColorValue = 255), rgb(c(254, 252,
            250, 247, 197, 122), c(235, 197, 159, 104, 27, 1),
            c(226, 192, 181, 161, 138, 119), maxColorValue = 255),
            rgb(c(254, 252, 250, 247, 221, 174, 122), c(235,
                197, 159, 104, 52, 1, 1), c(226, 192, 181, 161,
                151, 126, 119), maxColorValue = 255), rgb(c(255,
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                197, 159, 104, 52, 1, 1), c(243, 221, 192, 181,
                161, 151, 126, 119), maxColorValue = 255), rgb(c(255,
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                224, 197, 159, 104, 52, 1, 1, 0), c(243, 221,
                192, 181, 161, 151, 126, 119, 106), maxColorValue = 255)),
        Reds = switch(n - 2, rgb(c(254, 252, 222), c(224, 146,
            45), c(210, 114, 38), maxColorValue = 255), rgb(c(254,
            252, 251, 203), c(229, 174, 106, 24), c(217, 145,
            74, 29), maxColorValue = 255), rgb(c(254, 252, 251,
            222, 165), c(229, 174, 106, 45, 15), c(217, 145,
            74, 38, 21), maxColorValue = 255), rgb(c(254, 252,
            252, 251, 222, 165), c(229, 187, 146, 106, 45, 15),
            c(217, 161, 114, 74, 38, 21), maxColorValue = 255),
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                rgb(c(254, 252, 252, 251, 239, 203, 153), c(229,
                    187, 146, 106, 59, 24, 0), c(217, 161, 114, 74,
                    44, 29, 13), maxColorValue = 255), rgb(c(255,
                    254, 252, 252, 251, 239, 203, 153), c(245, 224,
                    187, 146, 106, 59, 24, 0), c(240, 210, 161, 114,
                    74, 44, 29, 13), maxColorValue = 255), rgb(c(255,
                    254, 252, 252, 251, 239, 203, 165, 103), c(245,
                    224, 187, 146, 106, 59, 24, 15, 0), c(240, 210,
                    161, 114, 74, 44, 29, 21, 13), maxColorValue = 255)),
            RdYlBu = switch(n - 2, rgb(c(252, 255, 145), c(141, 255,
                191), c(89, 191, 219), maxColorValue = 255), rgb(c(215,
                253, 171, 44), c(25, 174, 217, 123), c(28, 97, 233,
                182), maxColorValue = 255), rgb(c(215, 253, 255,
                171, 44), c(25, 174, 255, 217, 123), c(28, 97, 191,
                233, 182), maxColorValue = 255), rgb(c(215, 252,
                254, 224, 145, 69), c(48, 141, 224, 243, 191, 117),
                c(39, 89, 144, 248, 219, 180), maxColorValue = 255),
                rgb(c(215, 252, 254, 255, 224, 145, 69), c(48, 141,
                    224, 255, 243, 191, 117), c(39, 89, 144, 191,
                    248, 219, 180), maxColorValue = 255), rgb(c(215,
                    244, 253, 254, 224, 171, 116, 69), c(48, 109,
                    174, 224, 243, 217, 173, 117), c(39, 67, 97,
                    144, 248, 233, 209, 180), maxColorValue = 255),
                rgb(c(215, 244, 253, 254, 255, 224, 171, 116, 69),
                    c(48, 109, 174, 224, 255, 243, 217, 173, 117),
                    c(39, 67, 97, 144, 191, 248, 233, 209, 180),
                    maxColorValue = 255), rgb(c(165, 215, 244, 253,
                    254, 224, 171, 116, 69, 49), c(0, 48, 109, 174,
                    224, 243, 217, 173, 117, 54), c(38, 39, 67, 97,
                    144, 248, 233, 209, 180, 149), maxColorValue = 255),
                rgb(c(165, 215, 244, 253, 254, 255, 224, 171, 116,
                    69, 49), c(0, 48, 109, 174, 224, 255, 243, 217,
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                    233, 209, 180, 149), maxColorValue = 255)), RdYlGn = switch(n
 -
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                191, 96), maxColorValue = 255), rgb(c(215, 253, 166,
                26), c(25, 174, 217, 150), c(28, 97, 106, 65), maxColorValue = 25
5),
                rgb(c(215, 253, 255, 166, 26), c(25, 174, 255, 217,
                    150), c(28, 97, 191, 106, 65), maxColorValue = 255),
                rgb(c(215, 252, 254, 217, 145, 26), c(48, 141, 224,
                    239, 207, 152), c(39, 89, 139, 139, 96, 80),
                    maxColorValue = 255), rgb(c(215, 252, 254, 255,
                    217, 145, 26), c(48, 141, 224, 255, 239, 207,
                    152), c(39, 89, 139, 191, 139, 96, 80), maxColorValue = 255),

                rgb(c(215, 244, 253, 254, 217, 166, 102, 26), c(48,
                    109, 174, 224, 239, 217, 189, 152), c(39, 67,
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                    97, 139, 139, 106, 99, 80), maxColorValue = 255),
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                    c(48, 109, 174, 224, 255, 239, 217, 189, 152),
                    c(39, 67, 97, 139, 191, 139, 106, 99, 80), maxColorValue = 25
5),
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                    0), c(0, 48, 109, 174, 224, 239, 217, 189, 152,
                    104), c(38, 39, 67, 97, 139, 139, 106, 99, 80,
                    55), maxColorValue = 255), rgb(c(165, 215, 244,
                    253, 254, 255, 217, 166, 102, 26, 0), c(0, 48,
                    109, 174, 224, 255, 239, 217, 189, 152, 104),
                    c(38, 39, 67, 97, 139, 191, 139, 106, 99, 80,
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                74), maxColorValue = 255), rgb(c(228, 55, 77, 152),
                c(26, 126, 175, 78), c(28, 184, 74, 163), maxColorValue = 255),
                rgb(c(228, 55, 77, 152, 255), c(26, 126, 175, 78,
                    127), c(28, 184, 74, 163, 0), maxColorValue = 255),
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                    78, 127, 255), c(28, 184, 74, 163, 0, 51), maxColorValue = 25
5),
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                    175, 78, 127, 255, 86), c(28, 184, 74, 163, 0,
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                    78, 127, 255, 86, 129), c(28, 184, 74, 163, 0,
                    51, 40, 191), maxColorValue = 255), rgb(c(228,
                    55, 77, 152, 255, 255, 166, 247, 153), c(26,
                    126, 175, 78, 127, 255, 86, 129, 153), c(28,
                    184, 74, 163, 0, 51, 40, 191, 153), maxColorValue = 255)),
            Set2 = switch(n - 2, rgb(c(102, 252, 141), c(194, 141,
                160), c(165, 98, 203), maxColorValue = 255), rgb(c(102,
                252, 141, 231), c(194, 141, 160, 138), c(165, 98,
                203, 195), maxColorValue = 255), rgb(c(102, 252,
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                252, 141, 231, 166, 255), c(194, 141, 160, 138, 216,
                217), c(165, 98, 203, 195, 84, 47), maxColorValue = 255),
                rgb(c(102, 252, 141, 231, 166, 255, 229), c(194,
                    141, 160, 138, 216, 217, 196), c(165, 98, 203,
                    195, 84, 47, 148), maxColorValue = 255), rgb(c(102,
                    252, 141, 231, 166, 255, 229, 179), c(194, 141,
                    160, 138, 216, 217, 196, 179), c(165, 98, 203,
                    195, 84, 47, 148, 179), maxColorValue = 255)),
            Set3 = switch(n - 2, rgb(c(141, 255, 190), c(211, 255,
                186), c(199, 179, 218), maxColorValue = 255), rgb(c(141,
                255, 190, 251), c(211, 255, 186, 128), c(199, 179,
                218, 114), maxColorValue = 255), rgb(c(141, 255,
                190, 251, 128), c(211, 255, 186, 128, 177), c(199,
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                    179, 218, 114, 211), maxColorValue = 255), rgb(c(141,
                    255, 190, 251, 128, 253), c(211, 255, 186, 128, 177,
                    180), c(199, 179, 218, 114, 211, 98), maxColorValue = 255),
                    rgb(c(141, 255, 190, 251, 128, 253, 179), c(211,
                        255, 186, 128, 177, 180, 222), c(199, 179, 218,
                        114, 211, 98, 105), maxColorValue = 255), rgb(c(141,
                        255, 190, 251, 128, 253, 179, 252), c(211, 255,
                        186, 128, 177, 180, 222, 205), c(199, 179, 218,
                        114, 211, 98, 105, 229), maxColorValue = 255),
                    rgb(c(141, 255, 190, 251, 128, 253, 179, 252, 217),
                        c(211, 255, 186, 128, 177, 180, 222, 205, 217),
                        c(199, 179, 218, 114, 211, 98, 105, 229, 217),
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                        128, 253, 179, 252, 217, 188), c(211, 255, 186,
                        128, 177, 180, 222, 205, 217, 128), c(199, 179,
                        218, 114, 211, 98, 105, 229, 217, 189), maxColorValue = 255),

                    rgb(c(141, 255, 190, 251, 128, 253, 179, 252, 217,
                        188, 204), c(211, 255, 186, 128, 177, 180, 222,
                        205, 217, 128, 235), c(199, 179, 218, 114, 211,
                        98, 105, 229, 217, 189, 197), maxColorValue = 255),
                    rgb(c(141, 255, 190, 251, 128, 253, 179, 252, 217,
                        188, 204, 255), c(211, 255, 186, 128, 177, 180,
                        222, 205, 217, 128, 235, 237), c(199, 179, 218,
                        114, 211, 98, 105, 229, 217, 189, 197, 111),
                        maxColorValue = 255)), Spectral = switch(n -
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                    191, 148), maxColorValue = 255), rgb(c(215, 253,
                    171, 43), c(25, 174, 221, 131), c(28, 97, 164, 186),
                    maxColorValue = 255), rgb(c(215, 253, 255, 171, 43),
                    c(25, 174, 255, 221, 131), c(28, 97, 191, 164, 186),
                    maxColorValue = 255), rgb(c(213, 252, 254, 230, 153,
                    50), c(62, 141, 224, 245, 213, 136), c(79, 89, 139,
                    152, 148, 189), maxColorValue = 255), rgb(c(213,
                    252, 254, 255, 230, 153, 50), c(62, 141, 224, 255,
                    245, 213, 136), c(79, 89, 139, 191, 152, 148, 189),
                    maxColorValue = 255), rgb(c(213, 244, 253, 254, 230,
                    171, 102, 50), c(62, 109, 174, 224, 245, 221, 194,
                    136), c(79, 67, 97, 139, 152, 164, 165, 189), maxColorValue = 25
5),

                    rgb(c(213, 244, 253, 254, 255, 230, 171, 102, 50),
                        c(62, 109, 174, 224, 255, 245, 221, 194, 136),
                        c(79, 67, 97, 139, 191, 152, 164, 165, 189),
                        maxColorValue = 255), rgb(c(158, 213, 244, 253,
                        254, 230, 171, 102, 50, 94), c(1, 62, 109, 174,
                        224, 245, 221, 194, 136, 79), c(66, 79, 67, 97,
                        139, 152, 164, 165, 189, 162), maxColorValue = 255),
                    rgb(c(158, 213, 244, 253, 254, 255, 230, 171, 102,
                        50, 94), c(1, 62, 109, 174, 224, 255, 245, 221,
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                    194, 136, 79), c(66, 79, 67, 97, 139, 191, 152,
                    164, 165, 189, 162), maxColorValue = 255)), YlGn = switch(n -

                2, rgb(c(247, 173, 49), c(252, 221, 163), c(185,
                142, 84), maxColorValue = 255), rgb(c(255, 194, 120,
                35), c(255, 230, 198, 132), c(204, 153, 121, 67),
                maxColorValue = 255), rgb(c(255, 194, 120, 49, 0),
                c(255, 230, 198, 163, 104), c(204, 153, 121, 84,
                    55), maxColorValue = 255), rgb(c(255, 217, 173,
                120, 49, 0), c(255, 240, 221, 198, 163, 104), c(204,
                163, 142, 121, 84, 55), maxColorValue = 255), rgb(c(255,
                217, 173, 120, 65, 35, 0), c(255, 240, 221, 198,
                171, 132, 90), c(204, 163, 142, 121, 93, 67, 50),
                maxColorValue = 255), rgb(c(255, 247, 217, 173, 120,
                65, 35, 0), c(255, 252, 240, 221, 198, 171, 132,
                90), c(229, 185, 163, 142, 121, 93, 67, 50), maxColorValue = 25
5),
                rgb(c(255, 247, 217, 173, 120, 65, 35, 0, 0), c(255,
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                    185, 163, 142, 121, 93, 67, 55, 41), maxColorValue = 255)),
            YlGnBu = switch(n - 2, rgb(c(237, 127, 44), c(248, 205,
                127), c(177, 187, 184), maxColorValue = 255), rgb(c(255,
                161, 65, 34), c(255, 218, 182, 94), c(204, 180, 196,
                168), maxColorValue = 255), rgb(c(255, 161, 65, 44,
                37), c(255, 218, 182, 127, 52), c(204, 180, 196,
                184, 148), maxColorValue = 255), rgb(c(255, 199,
                127, 65, 44, 37), c(255, 233, 205, 182, 127, 52),
                c(204, 180, 187, 196, 184, 148), maxColorValue = 255),
                rgb(c(255, 199, 127, 65, 29, 34, 12), c(255, 233,
                    205, 182, 145, 94, 44), c(204, 180, 187, 196,
                    192, 168, 132), maxColorValue = 255), rgb(c(255,
                    237, 199, 127, 65, 29, 34, 12), c(255, 248, 233,
                    205, 182, 145, 94, 44), c(217, 177, 180, 187,
                    196, 192, 168, 132), maxColorValue = 255), rgb(c(255,
                    237, 199, 127, 65, 29, 34, 37, 8), c(255, 248,
                    233, 205, 182, 145, 94, 52, 29), c(217, 177,
                    180, 187, 196, 192, 168, 148, 88), maxColorValue = 255)),
            YlOrBr = switch(n - 2, rgb(c(255, 254, 217), c(247, 196,
                95), c(188, 79, 14), maxColorValue = 255), rgb(c(255,
                254, 254, 204), c(255, 217, 153, 76), c(212, 142,
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                217, 153), c(255, 217, 153, 95, 52), c(212, 142,
                41, 14, 4), maxColorValue = 255), rgb(c(255, 254,
                254, 254, 217, 153), c(255, 227, 196, 153, 95, 52),
                c(212, 145, 79, 41, 14, 4), maxColorValue = 255),
                rgb(c(255, 254, 254, 254, 236, 204, 140), c(255,
                    227, 196, 153, 112, 76, 45), c(212, 145, 79,
                    41, 20, 2, 4), maxColorValue = 255), rgb(c(255,
                    255, 254, 254, 254, 236, 204, 140), c(255, 247,
```
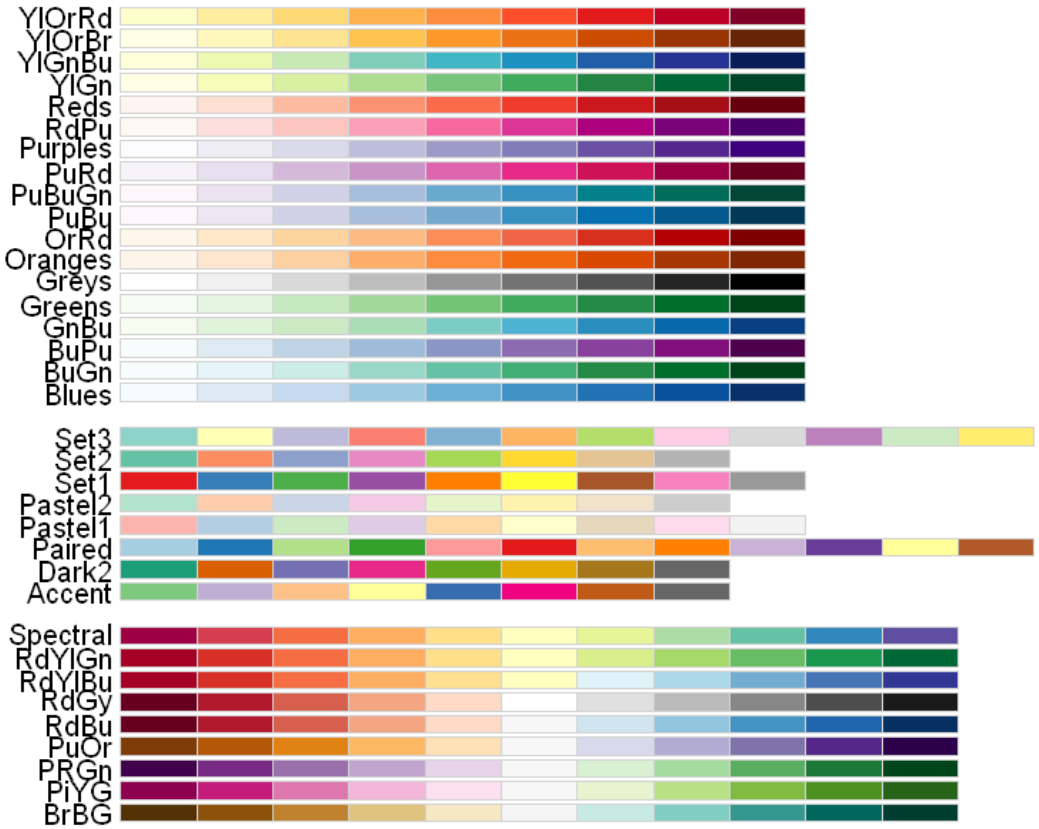
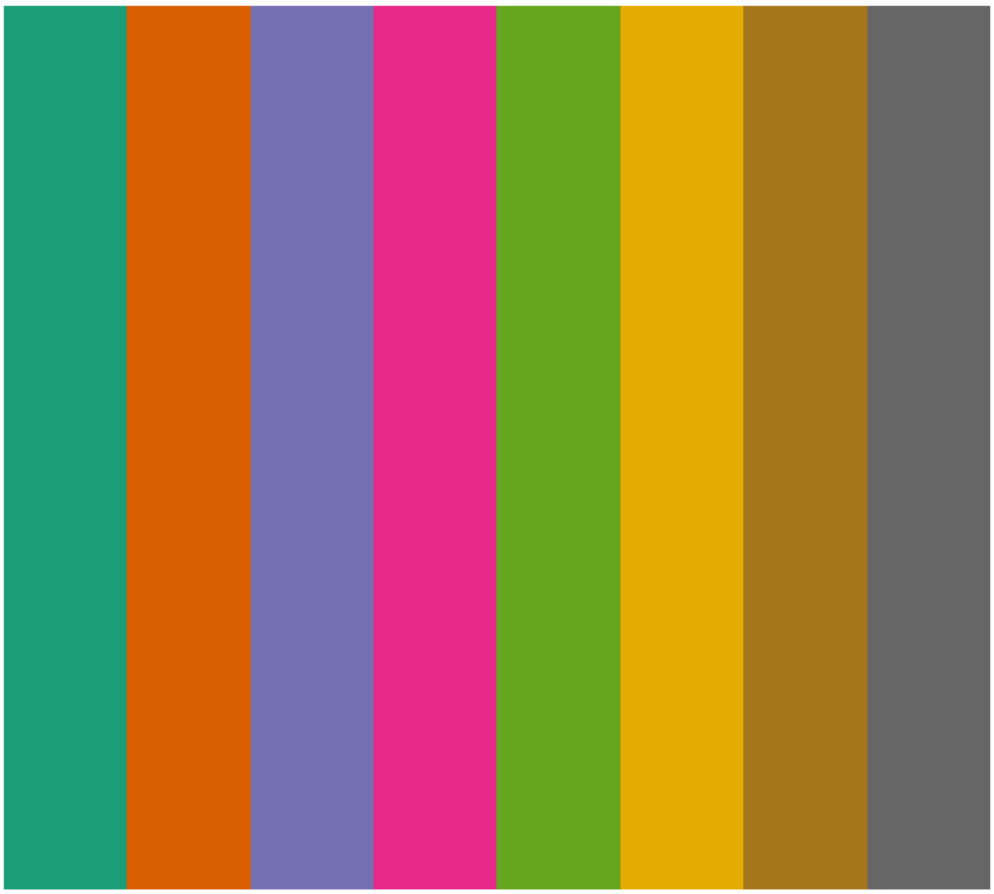
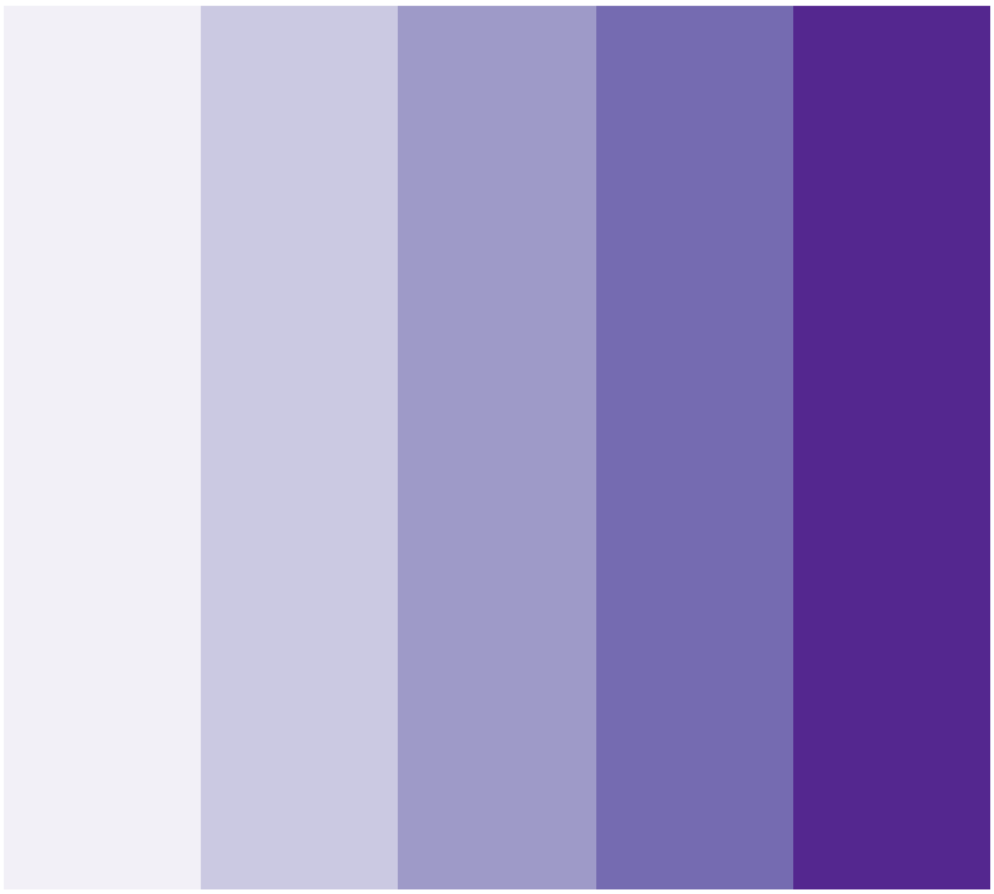

```
                    227, 196, 153, 112, 76, 45), c(229, 188, 145,
                    79, 41, 20, 2, 4), maxColorValue = 255), rgb(c(255,
                    255, 254, 254, 254, 236, 204, 153, 102), c(255,
                    247, 227, 196, 153, 112, 76, 52, 37), c(229,
                    188, 145, 79, 41, 20, 2, 4, 6), maxColorValue = 255)),
            YlOrRd = switch(n - 2, rgb(c(255, 254, 240), c(237, 178,
                59), c(160, 76, 32), maxColorValue = 255), rgb(c(255,
                254, 253, 227), c(255, 204, 141, 26), c(178, 92,
                60, 28), maxColorValue = 255), rgb(c(255, 254, 253,
                240, 189), c(255, 204, 141, 59, 0), c(178, 92, 60,
                32, 38), maxColorValue = 255), rgb(c(255, 254, 254,
                253, 240, 189), c(255, 217, 178, 141, 59, 0), c(178,
                118, 76, 60, 32, 38), maxColorValue = 255), rgb(c(255,
                254, 254, 253, 252, 227, 177), c(255, 217, 178, 141,
                78, 26, 0), c(178, 118, 76, 60, 42, 28, 38), maxColorValue = 25
5),
                rgb(c(255, 255, 254, 254, 253, 252, 227, 177), c(255,
                    237, 217, 178, 141, 78, 26, 0), c(204, 160, 118,
                    76, 60, 42, 28, 38), maxColorValue = 255), rgb(c(255,
                    255, 254, 254, 253, 252, 227, 189, 128), c(255,
                    237, 217, 178, 141, 78, 26, 0, 0), c(204, 160,
                    118, 76, 60, 42, 28, 38, 38), maxColorValue = 255)))
}
```


YlOrRd
YlOrBr
YlGnBu
YlGn
Reds
RdPu
Purples
PuRd
PuBuGn
PuBu
OrRd
Oranges
Greys
Greens
GnBu
BuPu
BuGn
Blues
Set3
Set2
Set1
Pastel2
Pastel1
Paired
Dark2
Accent
Spectral
RdYlGn
RdYlBu
RdGy
RdBu
PuOr
PRGn
PiYG
BrBG

In [65]:
```
display.brewer.pal(8,"Dark2")
pal2<-brewer.pal(8,"Dark2")
```



Dark2 (qualitative)



Purples (sequential)

In [71]:
```
wordcloud(Literature_text.corpus,min.freq=30,max.words=100,random.order=T,colo
rs=pal2)
```

In [72]:
```
install.packages("data.lab")
```

```
Installing package into 'C:/Users/user/Documents/R/win-library/3.4'
(as 'lib' is unspecified)
Warning message:
"package 'data.lab' is not available (for R version 3.4.3)"
```

In [73]:
```
install.packages("recommenderlab")
```

```
Installing package into 'C:/Users/user/Documents/R/win-library/3.4'
(as 'lib' is unspecified)

package 'recommenderlab' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
        C:\Users\user\AppData\Local\Temp\RtmpaYdVuv\downloaded_packages
```

In [74]:
```
library(data.table)
library(recommenderlab)
```

```
Attaching package: 'data.table'

The following objects are masked from 'package:dplyr':

    between, first, last

Loading required package: Matrix
Loading required package: arules

Attaching package: 'arules'

The following object is masked from 'package:dplyr':

    recode

The following object is masked from 'package:tm':

    inspect

The following objects are masked from 'package:base':

    abbreviate, write

Loading required package: proxy

Attaching package: 'proxy'

The following object is masked from 'package:Matrix':

    as.matrix

The following objects are masked from 'package:stats':

    as.dist, dist

The following object is masked from 'package:base':

    as.matrix

Loading required package: registry
```

In [76]:
```
recommenderRegistry$get_entry_names()
```

'ALS_realRatingMatrix' 'ALS_implicit_realRatingMatrix'
'ALS_implicit_binaryRatingMatrix' 'AR_binaryRatingMatrix'
'IBCF_binaryRatingMatrix' 'IBCF_realRatingMatrix'
'POPULAR_binaryRatingMatrix' 'POPULAR_realRatingMatrix'
'RANDOM_realRatingMatrix' 'RANDOM_binaryRatingMatrix'
'RERECOMMEND_realRatingMatrix' 'SVD_realRatingMatrix'
'SVDF_realRatingMatrix' 'UBCF_binaryRatingMatrix' 'UBCF_realRatingMatrix'

In [79]:
```
# Loading to pre-computed Literature data

 Literature.data<-Literature[,c(1,2,5)]

 Literature.matrix<- as(Literature.data,"realRatingMatrix")
```

In [80]:
```
# Creation of the model - U(ser) B(ased) C(ollaborative) F(iltering)
 Rec.model=Recommender(Literature.matrix[1:3000],method="UBCF",
                       param=list(normalize = "Z-score",method="Cosine",nn=5,
 minRating=1))
```

```
Warning message:
"Unknown parameters: minRating"
```

```
Available parameter (with default values):
method   =  cosine
nn       =  25
sample   =  FALSE
normalize        =  center
verbose  =  FALSE
```

In [81]:
```
# recommended top 5 items for user
 recommended.items.13449 <- predict(Rec.model, Literature.matrix["13449",], n=
5)
```

In [82]:
```
as(recommended.items.13449, "list")
```

```
$`13449` =

    '446'  '4413'  '4421'  '4422'  '4451'
```

In [83]:
```
#to predict affinity to all non-rated items
 predicted.affinity.13449 <- predict(Rec.model, Literature.matrix["13449",], t
ype="ratings")
```

In [84]:
```
# to see the user's predicted affinity for items we didn't have any value for
 as(predicted.affinity.13449, "list")
```

$`13449` =

446	5
4413	5
4421	5
4422	5
4451	5
4453	5
4481	5
44312	5
44412	5
44413	5
44831	5
45111	5
45112	5
45321	5
45322	5
443111	5
443112	5
451211	5
451212	5
451213	5
451214	5
451215	5
451216	5
451217	5
451218	5
451219	5
451220	5
451221	5

In [85]:
```
# .. and the real affinity for the items obtained from the affinity.matrix
 as(Literature.matrix["13449",], "list")
```

$`13449` = 4482: 5

In [86]:
```
#create evaluation scheme splitting taking 90% of the date for training and le
aving 10% for validation or test
 e <- evaluationScheme(Literature.matrix[1:3000], method="split", train=0.9, g
iven=1)
```

In [87]:
```
# creation of recommender model based on ubcf
 Rec.ubcf <- Recommender(getData(e, "train"), "UBCF")
 # creation of recommender model based on ibcf for comparison
 Rec.ibcf <- Recommender(getData(e, "train"), "IBCF")
 # making predictions on the test data set
 p.ubcf <- predict(Rec.ubcf, getData(e, "known"), type="ratings")
 # making predictions on the test data set
 p.ibcf <- predict(Rec.ibcf, getData(e, "known"), type="ratings")
 # obtaining the error metrics for both approaches and comparing them
 error.ubcf<-calcPredictionAccuracy(p.ubcf, getData(e, "unknown"))
 error.ibcf<-calcPredictionAccuracy(p.ibcf, getData(e, "unknown"))
 error <- rbind(error.ubcf,error.ibcf)
 rownames(error) <- c("UBCF","IBCF")
 error
```

	RMSE	MSE	MAE
UBCF	7.438638	55.33333	5.777778
IBCF	NaN	NaN	NaN

In [91]:
```
#validation of the model
 evaluation_scheme <- evaluationScheme(Literature.matrix, method="cross-valida
tion", k=5, given=1, goodRating=5) #k=5 meaning a 5-fold cross validation. giv
en=1 meaning a Given-1 protocol
 evaluation_results <- evaluate(evaluation_scheme, method="UBCF", n=c(1,3,5,10
,15,20))
 eval_results <- getConfusionMatrix(evaluation_results)[[1]]
 eval_results
```

```
UBCF run fold/sample [model time/prediction time]
         1  [0sec/1.05sec]
         2  [0.02sec/0.86sec]
         3  [0sec/1.03sec]
         4  [0.01sec/0.76sec]
         5  [0sec/0.97sec]
```

	TP	FP	FN	TN	precision	recall	TPR	FPR
1	0	0.5098361	0.104918	27.38525	0	0	0	0.01820843
3	0	1.5295082	0.104918	26.36557	0	0	0	0.05462529
5	0	2.5491803	0.104918	25.34590	0	0	0	0.09104215
10	0	5.0983607	0.104918	22.79672	0	0	0	0.18208431
15	0	7.6475410	0.104918	20.24754	0	0	0	0.27312646
20	0	10.1967213	0.104918	17.69836	0	0	0	0.36416862

In [92]:
```
#validation of the model
 evaluation_scheme <- evaluationScheme(Literature.matrix, method="cross-valida
tion", k=5, given=1, goodRating=5) #k=5 meaning a 5-fold cross validation. giv
en=1 meaning a Given-1 protocol
 evaluation_results <- evaluate(evaluation_scheme, method="UBCF", n=c(1,3,5,10
,15,20))
 eval_results <- getConfusionMatrix(evaluation_results)[[1]]
 eval_results
```

```
UBCF run fold/sample [model time/prediction time]
         1  [0sec/0.83sec]
         2  [0sec/1.03sec]
         3  [0.01sec/0.97sec]
         4  [0sec/0.81sec]
         5  [0sec/0.94sec]
```

	TP	FP	FN	TN	precision	recall	TPR
1	0.000000000	0.4983607	0.1180328	27.38361	0.0000000000	0.00000000	0.00000000
3	0.000000000	1.4950820	0.1180328	26.38689	0.0000000000	0.00000000	0.00000000
5	0.000000000	2.4918033	0.1180328	25.39016	0.0000000000	0.00000000	0.00000000
10	0.000000000	4.9836066	0.1180328	22.89836	0.0000000000	0.00000000	0.00000000
15	0.000000000	7.4754098	0.1180328	20.40656	0.0000000000	0.00000000	0.00000000
20	0.001639344	9.9655738	0.1163934	17.91639	0.0001644737	0.01388889	0.01388889

eval_results