

Contributing to R

Gabriel Becker and Martin Maechler

Who We Are

Martin Maechler - R-core (and R-Foundation)

- ▶ R-core from the start (1997) and R-Foundation Board.
 - ▶ Co-Creator (with Doug Bates) and maintainer of Matrix, cluster, robustbase, Rmpfr, ..
- ▶ ETH Zurich, adjoint Prof in Math Stats
- ▶ ESS (Emacs Speaks Statistics) Project Lead

Gabriel Becker - Frequent Collaborator with R-core

- ▶ Arguably most feature additions to R from external collaborator “in recent times”
 - ▶ Proposed ALTREP, collaborated with Luke Tierney on design and implementation
 - ▶ `debug(., signature =)` and `debugcall(print(.))` with Michael Lawrence
 - ▶ `head(mymatrix, c(5, 5))` with Martin Maechler
 - ▶ `update_PACKAGES()` with Michael Lawrence
 - ▶ `sessionInfo()` returns RNG information when not the default, with Martin Maechler
 - ▶ `which()` long vector and ALTREP support, with Martin Maechler
 - ▶ `ifelse()` refactor for significant speedup with Kurt Hornik
 - ▶ `duplicated()/unique()/anyDuplicated()` sortedness-aware ALTREP fastpass (for now in R-devel, only) with Michael Lawrence

Learning How to Contribute to R

The Goal

▶ **Is**

- ▶ Helping R
- ▶ By helping R-core maintain it
- ▶ Thus benefiting ourselves and the larger R community

▶ **Is Not**

- ▶ Professional advancement
- ▶ Personal recognition/fame (though acknowledgment will occur)

We will focus on

- ▶ What kinds of efforts help
 - ▶ and how to perform them
- ▶ What kinds of well-meaning efforts do not help
 - ▶ And how to avoid or improve them

The Shoulders of Giants - Previous/Ongoing Outreach and Engagement

The R Blog (R-core & R Foundation)

<https://developer.r-project.org/Blog/public/>

2019-10:



About

R Can Use Your Help: Reviewing Bug Reports

Tomas Kalibera, Luke Tierney

2019-12:



About

Thanks for Reviewing Bug Reports

Tomas Kalibera, Luke Tierney

Categories: External Contributions

Tags: debugging, bugs, bugzilla

First published: 2019/12/16

2021-04:



About

R Can Use Your Help: Testing R Before Release

Tomas Kalibera, Luke Tierney, Kurt Hornik

Categories: External Contributions

Tags: testing, bugs, bugzilla

First published: 2021/04/28

R-Foundation FORWARDS - R Contribution Working Group

- ▶ Organized by Heather Turner
- ▶ R Core Members
 - ▶ Luke Tierney, Michael Lawrence, Martyn Plummer
- ▶ R Foundation members
 - ▶ Jenny Bryan, Di Cook
- ▶ R community members you may have heard of
 - ▶ Kara Woo, Amelia McNamara, Toby Hocking, Michael Chirico, Brodie Gaslam, Sebastian Meyer
 - ▶ And many you likely will soon hear of

R Contribution Working Group

- ▶ R-devel Slack
 - ▶ ~110 members
 - ▶ not super active - **yet***
- ▶ (early ongoing development) R Developer's Guide
 - ▶ Saranjeet Kaur working with Heather Turner and Michael Lawrence
 - ▶ <https://github.com/forwards/rdevguide>

Gabe As A Case Study - Illustrative Examples From a Patchy Past

Circa 2013 - The CV Padder (AKA Graduate Student)

PR#15253 - identify() Hanging

- ▶ Simon Anders posted a reproducible example
- ▶ I diagnosed the problem:
 - ▶ Hang was in `locator C` function not identify logic per se.
- ▶ I wrote and submitted a proposed patch
 - ▶ No response on bugzilla other than bug status changed to closed-fixed
 - ▶ Could see changes in trunk; patch accepted

Bitwise Operations For Raw Vectors

- ▶ Reported by Mark Bravington
- ▶ I proposed a patch modifying the C code underlying `bitw*()` R functions
- ▶ Bitwise logical operators implemented in raw methods to standard logical operators
- ▶ Patch not accepted
- ▶ Bug closed as fixed after documentation change by R-core member

Take Away Points

- ▶ Working patches will not always be accepted, even if nothing is wrong
 - ▶ These take the same amount of work from the submitter
- ▶ Sometimes a patch changing behavior is not the correct fix
 - ▶ Even to problems that are real

Circa 2015 - Icarus Flies With Such Very Sturdy Wings

PR#16385 - All logical operators (silently) behave as ! when called with 1 argument

- ▶ Reported By Barry Rowlingson



```
`&`(TRUE)
```

```
FALSE
```

- ▶ Huh, that's weird...

A Patch - My Benevolent Gift to R-core and R

...

And Then

Gabe

Created attachment 1828 [details] Fix patch

I called checkArity with the signature of Rf_checkArity (including the call) in the previous patch, which was incorrect. This patch is tested and works.

Arity check needs to happen before the special casing for unary ops (assumed to be !) on simple logical scalars.

:-|

Martin

There's more: Gabriel said "tested"... well, not really: You did not run R's own tests successfully: These are listed as S3 generic primitives and so `&.foo <- function(x, ...) {
..... } has worked` and this is detected by our checks.

Consequently, the `checkArity()` test should *not* happen before dispatch...

I'm currently testing things

So ... Yeah. Not Great.

Take away points:

- ▶ Test your patches
- ▶ Test your patches
- ▶ Test your patches

Circa 2017 - Feature Engineering Over and Over

My First Added Feature (That ~0 People Know About Or Use)

- ▶ `debug(., signature =)` and `eval(debugcall(print(myclassedobj)))`
- ▶ S3 and S4 dispatch aware debugging.
 - ▶ Masks the weird `.local` thing function shenanigans you got in S4 method debugging at the time.

Some things to keep in mind about this success story

- ▶ I worked (as my job) with Michael Lawrence at Genentech during this time
 - ▶ He had just been elected to R-core
- ▶ 20+ comment conversation on bugzilla about it
 - ▶ 4 distinct versions of the patch

More context

- ▶ I disagreed with Michael and Martin about design/API for `debugcall`
 - ▶ My patches after the first iteration implemented their preferred API
- ▶ Accepted, but not until after feature freeze
 - ▶ Remained in R-devel only for nearly a year
- ▶ Patch was still further refactored by Michael in the process

Circa 2016 - 2019 - The ALTREP Years

The Proposal

- ▶ Proposed ALTREP at DSC 2016 (research conference/R-core meeting)
 - ▶ Was in contact with Luke before meeting, had informal interest
 - ▶ Accepted as a way forward following meeting
 - ▶ Was proposing enormous internal change - “Backwards Compatible” were first two words in talk title.

Implementation 2017-2018

- ▶ My proof of concept was a type of vector that was a “window” to another vector’s data
 - ▶ “Worked” but didn’t respect R’s copy on write semantics
- ▶ Luke implemented the ALTREP framework
 - ▶ I contributed code, some is still in, some was buggy so not accepted/taken back out.
- ▶ Luke asked that Michael review my code internally (we were still both at Genentech) before submitting
 - ▶ This was hard to hear but is understandable.

Post Inclusion 2019

- ▶ I've submitted several accepted patches which implement or further ALTREP support in the R internals
 - ▶ Some directly to Luke, most via Bugzilla

Take Away

- ▶ Code submitted to R-core members should be very mature
 - ▶ This is difficult, comes with practice somewhat
 - ▶ Code review may be painful but is a great tool to get better
 - ▶ R-core collectively have little time spread across
 - ▶ their own work
 - ▶ Teaching or day-job duties

Circa 2020 - Heady Days

Making `head()`s or `tail()`s of Large Rectangular Things

- ▶ Make `head` take rectangular slice rather than only in rows
 - ▶ Requested as change by Michael Chirico on R-devel (the **mailing list**).
 - ▶ Backwards Compatible form proposed by me on R-devel

The Patch

- ▶ I propose patch
 - ▶ Passed all R's tests (I had learned)
 - ▶ “quite a bit of breakage on CRAN” - Martin Maechler

The Patch Cont

- ▶ Martin requested I not submit more code, as he was iterating on a local copy to track down and fix CRAN breakages

Suharto Anggono

- ▶ Suggested numerous changes to the patch
 - ▶ This was frustrating, but
 - ▶ He correctly identified multiple flaws in initial versions of the patch
 - ▶ Martin agreed with him on some of the coding style/implementation changes, not on others

Take Away Points

- ▶ Patches are not your baby
 - ▶ Critiques can feel like attacks but better patches make R better.
 - ▶ Learn from this type of feedback
- ▶ It is often easier for R-core members to make changes themselves than accept/iterate on patches

Circa 2020-2021 - Duplicated Efforts

(Significant) speedup to duplicated/unique/etc for sorted ALTREPs

- ▶ Large chunk of code
- ▶ I Partially-fully implemented it multiple times
 - ▶ Bug fixes
 - ▶ Multiple (refactors)/code cleanup passes
 - ▶ Extremely exhaustive testing script
- ▶ All *before* even initial submission on bugzilla

Luke was focused on the Native Pipe

- ▶ He didn't have time to closely vet hundreds of lines of unsolicited C code
- ▶ Patch sat in bugzilla and I waited
 - ▶ Not personal, Luke just didn't have bandwidth

Enter Michael Lawrence

- ▶ Contacted me and collaborated on getting the patch in
 - ▶ Asked me to formalize my test script into unit tests (oops, duh!)
 - ▶ Got it in, we hoped in time for release, but it turned out not
 - ▶ Will be in next release assuming no problems identified

Take Away Points

- ▶ Sometimes a suggestion/patch not being taken up has nothing to do with the suggestion
 - ▶ Especially when it was unsolicited
- ▶ Never submit a significant code change without regression tests
- ▶ Be patient - Occasional reminders are ok, Nagging (at the very best) wont help

Overall Take Always

No One is Perfect ... **But**

- ▶ When collaborating with R-core
 - ▶ Make as little work for them as possible
 - ▶ Be respectful, not demanding.
 - ▶ Sometimes the answer is no, even if you still think the idea is good
 - ▶ Even if the idea **is** good
 - ▶ If you cant accept that this isn't the right game for you to play
 - ▶ Never “shoot from the hip”, each change is a change

Test, test, test

- ▶ Always test patches with `make check-devel` *before submission*
- ▶ Submit some form of testing/confirmation
 - ▶ Test script that R-core can consider and add as formal tests
 - ▶ Note if you don't have this, you're not ready to submit
 - ▶ Formal tests, sometimes, but these take a lot of care in designing

Contributing to R - No Patches Yet

Confirming bugs

- ▶ Is the reported issue present for you?
 - ▶ Particularly if on different OS than initial report

Generating reproducible examples which **only** use base packages

- ▶ Are any non-base packages loaded by example code? (!!)
- ▶ Can you construct an only-base-R version?
 - ▶ If that fails it is likely a *package* bug, i.e., *not* a bug in R.

Careful bug analysis

- ▶ Maybe *experiment* : systematically try different invocations of the function: which results are good, which not?
- ▶ Read the help page of that function **carefully**
- ▶ But then, it is essentially **debugging** :
 - ▶ `traceback()`
 - ▶ `debug(_<fn>_)`
 - ▶ `debugonce(_<fn>_)`
 - ▶ `trace(_<fn>_, ..)` and
 - ▶ `options(error=recover)` are your friends
- ▶ *Hint*: during debugging, Martin's favorite `ls.str()` is often useful.

Code Analysis Practicum

Start R In Your Docker Containers (R version 3.3.2 (2016-10-31))

(or R 3.3.3, 3.4.0, 3.4.1, but not newer) and run

```
hist(c(1, 1, 1, 1 + 1e-15, 2), breaks="FD")
```

R (3.3.2) console:

```
R version 3.3.2 (2016-10-31) -- "Sincere Pumpkin Patch"  
Copyright (C) 2016 The R Foundation for Statistical Computing  
...
```

```
> hist(c(1, 1, 1, 1 + 1e-15, 2), breaks="FD")  
Warning in pretty.default(range(x), n = breaks, min.n = 1) :  
  NAs introduced by coercion to integer range  
Error in pretty.default(range(x), n = breaks, min.n = 1) :  
  invalid 'n' argument  
>
```

```
> traceback()  
4: pretty.default(range(x), n = breaks, min.n = 1)  
3: pretty(range(x), n = breaks, min.n = 1)  
2: hist.default(c(1, 1, 1, 1 + 1e-15, 2), breaks = "FD")  
1: hist(c(1, 1, 1, 1 + 1e-15, 2), breaks = "FD")  
>
```

Code Analysis Practicum Discussion

What did you find?

- ▶ Discussion with participants

The Issue: `pretty.default()` got a value it didn't like

- ▶ `n` is “invalid”
 - ▶ What does that mean?
 - ▶ what does the `n` argument do for `pretty` (/ `pretty.default`)?
 - ▶ what kind of value *should* it have?

Invalid n - What does that mean?

The warning was a clue

- ▶ What does it tell us?

Okay, n was crazy big - how did it get that way?

- ▶ `pretty.default` was passed `n = breaks`
 - ▶ from in what?

hist.default and breaks

What part of `hist.default` is actually generating the huge value when called as `hist(., breaks="FD")`

nclass.FD - So what is the problem?

```
> nclass.FD
function (x)
{
  h <- stats::IQR(x)
  if (h == 0)
    h <- stats::mad(x, constant = 2)
  if (h > 0)
    ceiling(diff(range(x))/(2 * h * length(x)^(-1/3)))
  else 1L
}
```

Ah. It is dividing by

An extremely small (essentially zero) number

What Now?

Well That's Complicated

- ▶ Optimal *automatic* histogram construction is actually difficult
- ▶ The `nclass*()` functions are the result of research and publications in (applied and mathematical) statistics with goal

find an optimal number of histogram bins

- ▶ FD is a published algorithm ('Friedman-Diaconis') (=> *read* the help page!)
 - ▶ Users specifically request it via `breaks="FD"`

It's even more complicated (Martin M.)

- ▶ Experience of an “extremist” (MM): Published algorithms almost *never* take into account the most extreme boundary cases.
- ▶ But good scientific software such as R *should* deal with these cases, ideally *optimally*, but at least *gracefully*

Complicated – 2 –

Originally, the function was simply

```
nclass.FD <- function(x)
{
  r <- as.vector(quantile(x, c(0.25, 0.75)))
  h <- 2 * (r[2] - r[1]) * length(x)^(-1/3)
  ceiling(diff(range(x))/h)
}
```

introduced for R 1.4.0 (2001-12-19), stemming from {MASS} pkg, where it can be found in the CRAN archives of VR, in file VR/MASS/R/hist.scott.R, dated 1999-04-05 with first 2 lines

```
# file MASS/hist.scott.q
# copyright (C) 1994-8 W. N. Venables and B. D. Ripley
```

so this *is* from the beginning of statistical computing with **S** (the “mother” of **R**).

hist() and nclass.FD() – more complicated – 3 –

Note: *not* dealing with case when h is exactly zero if the 1st and 3rd quartiles Q_1 and Q_3 are equal, e.g. for `x <- c(0, 1,1,1, 99)`: in that case, `nclass.FD(x)` returned `Inf`. “Consequently”, in 2007, there was a change to the R source code:

r40860 | maechler | 2007-03-21 11:56:55
nclass.scott(x), nclass.FD(x) for var(x)==0

which changed the body of `nclass.FD` into

```
{  
  h <- stats::IQR(x)  
  if(h == 0) h <- stats::mad(x, constant = 2) # c=2: consistent with IQR  
  if (h > 0) ceiling(diff(range(x))/(2 * h * length(x)^(-1/3))) else 1L  
}
```

- ▶ hence the `h == 0` was dealt with, but actually not so smartly,
- ▶ see the Bugzilla PR #17274 discussion at https://bugs.r-project.org/bugzilla/show_bug.cgi?id=17274

Take Away Lessons

- ▶ Code analysis can be subtle
- ▶ Successful code analysis doesn't always tell us the fix
- ▶ Serious stat/math knowledge is required to touch some parts of R
- ▶ Even if you don't have them, you can still help

Submitting Bugs

Confirm it's present in up-to-date R-devel

Real bugs in your older version of R don't need to be reported if they are fixed in R-devel

Confirm it's a bug in R itself


Run it - in plain R (no RStudio or other IDE) - with no non-base/non-recommended packages loaded

Within R isolate it as much as you can

- ▶ To an R function which hits C code, or to the actual offending pure-R function
- ▶ Bonus points if you can (correctly) narrow it down further to which C function and why its choking

Search bugzilla: Has the bug already been reported?

R's Bugzilla: <https://bugs.r-project.org/bugzilla/>




The screenshot shows the R Bugzilla Main Page. At the top is a navigation bar with links: Home, New, Browse, Search, and a search input field. Below this is a large heading "Welcome to the R bug tracking system". Underneath the heading are four large icons in a row: a document icon labeled "File a Bug", a magnifying glass icon labeled "Search", a person icon labeled "Log In", and a question mark icon labeled "Documentation". Below these icons is a list of links: "Enter a new bug report", "Show open bugs new-to-old", and "Search existing bug reports". At the bottom, there is a "Common Queries:" section with two links: "Bugs reported in the last 24 hours" and "Bugs changed in the last 24 hours", each followed by a small RSS icon. A search bar with a "Quick Search" button is also visible.


Bugzilla - Main Page

Home New Browse Search Search [?] Reports Log In Forgot Password


Welcome to the R bug tracking system




File a Bug



Search



Log In







Documentation

- Enter a new bug report
- [Show open bugs new-to-old](#)
- Search existing bug reports

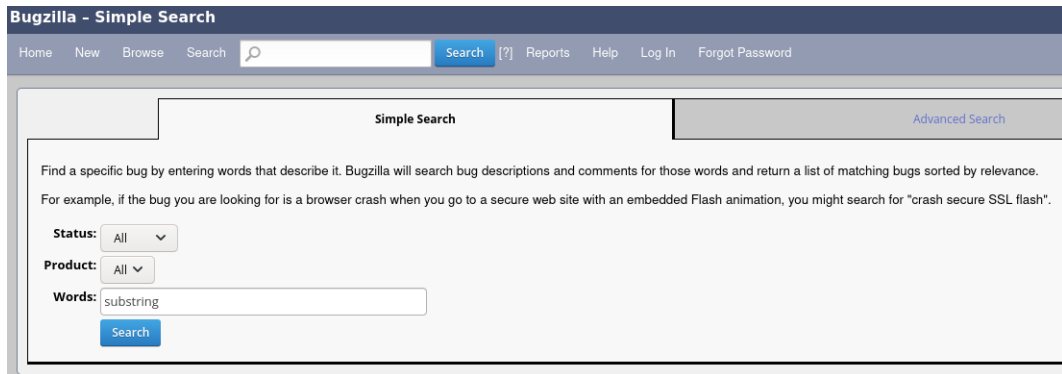
Enter a bug # or some search terms [?]

Common Queries:

Bugs reported in the [last 24 hours](#)  | [last 7 days](#) 

Bugs changed in the [last 24 hours](#)  | [last 7 days](#) 

Search for R Bugs (with 'substring')



The screenshot shows the Bugzilla Simple Search interface. At the top, there is a navigation bar with links: Home, New, Browse, Search, and a search icon. Below this is a search bar with a blue 'Search' button. To the right of the search bar are links for '[?]', Reports, Help, Log In, and Forgot Password. The main content area has two tabs: 'Simple Search' (active) and 'Advanced Search'. Below the tabs, there is a paragraph explaining the search process: 'Find a specific bug by entering words that describe it. Bugzilla will search bug descriptions and comments for those words and return a list of matching bugs sorted by relevance. For example, if the bug you are looking for is a browser crash when you go to a secure web site with an embedded Flash animation, you might search for "crash secure SSL flash".' Below this text are three filter sections: 'Status:' with a dropdown menu showing 'All', 'Product:' with a dropdown menu showing 'All', and 'Words:' with a text input field containing 'substring'. A blue 'Search' button is located below the 'Words:' field.

Bugzilla - Simple Search

Home New Browse Search **Search** [?] Reports Help Log In Forgot Password

Simple Search [Advanced Search](#)

Find a specific bug by entering words that describe it. Bugzilla will search bug descriptions and comments for those words and return a list of matching bugs sorted by relevance.

For example, if the bug you are looking for is a browser crash when you go to a secure web site with an embedded Flash animation, you might search for "crash secure SSL flash".

Status: All ▾

Product: All ▾

Words:

Search

Figure 1: Search for R Bugs

List of bug reports with 'substring'

Bugzilla - Bug List

Home New Browse Search Search [?] Reports Help Log In Forgot Password

Wed Jul 7 2021 12:54:34 UTC

[Hide Search Description](#)

Content: substring

29 bugs found.

ID	Product	Comp	Assignee	Status	Resolution	Summary	Changed
14507	R	Low-level	R-core	CLOS	FIXE	file.copy does not understand ">="	2014-02-16
11325	R	Graphics	jitterbug-import	CLOS	FIXE	X11 window title setting in X11().Device	2008-04-29
13956	R	Windows	jitterbug-import	CLOS	FIXE	Antwort: Re: [Rd] Memory management crash with UTF-8 on Windows (PR#13955)	2009-09-17
60	R	Language	jitterbug-import	CLOS	FIXE	substring("x", NULL) -> Floating exception: core dumped	1998-11-02
14446	R	Misc	R-core	CLOS	INVA	agrep looks for substring matches instead of full string	2019-05-14
279	R	Document	jitterbug-import	CLOS	FIXE	strsplit does not conform to documentation	1999-12-19
14958	R	Misc	R-core	CLOS	FIXE	Package using UTF-8 is broken when built in ISO-8859-1 locale	2012-06-28
960	R	Language	jitterbug-import	CLOS	FIXE	format() of a character matrix converts to vector	2001-05-31
1112	R	Misc	jitterbug-import	CLOS	INVA	RE: [R] Several R vs S-Plus issues	2001-10-03
1233	R	I/O	jitterbug-import	CLOS	FIXE	Slow 'read.table' in R-1.4.0	2001-12-30
1263	R	Language	jitterbug-import	CLOS	FIXE	labels returned by cut() when include.lowest=T	2002-01-15
2832	R	System-s	jitterbug-import	CLOS	WONT	R-1.7.0 build feedback: NetBSD-1.6	2011-03-21
6889	R	Wishlist	jitterbug-import	CLOS	FIXE	Wishlist: nchart for factors	2015-12-14
2192	R	Document	jitterbug-import	CLOS	FIXE	corrections for R-intro.tex	2004-08-23
8226	R	I/O	jitterbug-import	CLOS	FIXE	read.fwf doesn't work with header = TRUE	2005-10-24
17426	R	Windows	R-core	CLOS	FIXE	format.bibentry() fails for latin1-encoded given name in author field	2018-05-18
8284	R	Misc	jitterbug-import	CLOS	NOT	read.fwf; bug reports 8226 & 8236	2005-11-05
18027	R	Misc	R-core	CLOS	FIXE	Sys.getenv() splits on all "=", therefore also splitting the values of environment variables that contain "=",	2021-01-08
9443	R	Wishlist	jitterbug-import	CLOS	FIXE	Wishlist: Sweave: allow line breaks after forward slashes	2007-01-11
9444	R	Wishlist	jitterbug-import	CLOS	FIXE	Re: [Rd] Wishlist: Sweave: allow line breaks after forward slashes (PR#9443)	2007-01-11
9632	R	Add-ons	jitterbug-import	CLOS	FIXE	Correction to PR #9631	2007-04-23
9841	R	Windows	jitterbug-import	CLOS	FIXE	available.packages	2007-08-21
16214	R	Accuracy	R-core	CLOS	INVA	substring "-" replaces one letter	2015-02-20
16683	R	Low-level	R-core	CLOS	NOT	syntax error during parse kills R	2016-02-07

(obtain bugzilla account and) Submit bug

- ▶ [\[Reporting Bugs\]](#) on sidebar | [R home page](#)

Possibly Patches (but Still Probably Not)

R-core's Engineering Philosophy (as my interactions with them
have lead me to understand it)

R's Maintenance/Design Philosophy

- ▶ Backwards compatibility is **very** important
- ▶ Anything that can go in a package, should
 - ▶ At **least** as a testing/maturation stage
 - ▶ in many cases, indefinitely/“permanently”
 - ▶ Popularity in community not generally a counterargument
- ▶ R-core operates on “Individual Initiative + Lack of Opposition” model
 - ▶ Whether this is optimal is not relevant, it is the existing reality
 - ▶ Means convincing one R-core member usually enough

R's Maintenance/Design Philosophy Con't

- ▶ Probably no new Recommended pkgs, ever (- Luke Tierney)
 - ▶ Popularity again will not change this
- ▶ Proposing new features creates work for them
 - ▶ Even if you submit a patch
 - ▶ Even if the patch you submit is perfect
 - ▶ doesn't mean never do it, but be cognizant
- ▶ Helping squash bugs *saves* them work
 - ▶ Even with no patch
 - ▶ sometimes especially with no patch

So (for your own sake and R-core's) Do Not

- ▶ Start with feature additions
- ▶ Submit patches which change existing (non-bug) behavior without hearing from R-core they are interested
 - ▶ You not agreeing with the documented existing behavior does not make something a bug
- ▶ Expect quick turn around on wishlist items you file without a proposed patch
- ▶ Try to get another R-core member to overrule one whose decision you don't like
 - ▶ I don't know of any times where this happened. Lets keep it that way
 - ▶ I seriously doubt they would be amused (or that it would work anyway)
 - ▶ This is different than engaging in ongoing discussions on, e.g., [r-devel](#), **the** mailing list on *R Development*.

Documentation Patches

Typo reporting/fixes always welcome

- ▶ Usually a patch not required, just pointing it out on the r-devel mailing list
 - ▶ generally receives prompt and appreciative response

Larger changes to documentation

- ▶ Only when its really necessary or R-core has solicited/stated interest in a patch
- ▶ **Must be at least as technically correct as the old documentation**
 - ▶ Do not trade clarity/approachability for correctness
 - ▶ This means you must deeply, fully understand what the relevant function/system is doing

Code Patches

Always

- ▶ View the actual diff before submission
 - ▶ Should be **no** whitespace-only changes
- ▶ Consider/try to update documentation to reflect any changes
- ▶ **Test the exact diff file you are submitting using R-devel/trunk**
 - ▶ `make check-devel` after building R with your patch applied
- ▶ Provide test script/code and/or added unit tests

Avoid

- ▶ Patches which bundle enhancements with bug fixes
 - ▶ Even when they're related
- ▶ Patches which bundle multiple separable bug fixes
- ▶ Breaking backwards compatibility in anyway way
 - ▶ Unless you've heard from R-core member that it is desired

Feature Additions

Filing Wishlist items in bugzilla

- ▶ Low cost
- ▶ Appreciated
- ▶ Absolutely no guarantee of it ever being done

Unsolicited feature addition patches

- ▶ Generally . . . don't
 - ▶ Good chance it won't be adopted, don't want to waste your time
- ▶ Bring up on R-devel mailinglist or bugzilla wishlist item first

Solicited/interest confirmed behavior additions

- ▶ Good to collaborate, voice your opinion
 - ▶ R-core member has final say on all matters
 - ▶ they own the code once its in
- ▶ Be prepared to refactor code before submitting it to your collaborator
 - ▶ This is generally a good sign, your first pass is rarely your best
- ▶ Test it to within an inch of its life, then keep going
 - ▶ Think of any possible corner case you can, and test every single one of them
- ▶ If possible, have someone else technically skilled in R review it

Purely Speedup Patches

Generally Avoid them

- ▶ Need to be confident speeding up one thing doesn't slow down something else
- ▶ Speeding up code *usually* makes it
 - ▶ more complex
 - ▶ less maintainable

Only if they will make a real difference

- ▶ Making something that takes 2 nanoseconds take .5 nanoseconds
 - ▶ Speedup of 4x
 - ▶ Only matters if that thing happens **massively often** in real code
- ▶ Making something that took 10 seconds take 7 seconds
 - ▶ 1.4x speedup
 - ▶ Likely saves more actual time in a real script

Finding your way around a checkout of the R sources

Finding tests

Finding R code/documentation/etc of base packages

R checkout and Build Practicum? Is that even in scope? Uwe Ligges article about the tarball. R journal

Possible Patch Practicals

https://bugs.r-project.org/bugzilla/show_bug.cgi?id=17150

- ▶ as.person not handling multiple emails in the string
- ▶ requires
 - ▶ locating source code
 - ▶ regular expressions

https://bugs.r-project.org/bugzilla/show_bug.cgi?id=17167

- ▶ `is.ratetable()` inconsistent between `verbose=TRUE` and `verbose=FALSE`
- ▶ Not an R bug
 - ▶ Good practice for recognizing that

https://bugs.r-project.org/bugzilla/show_bug.cgi?id=16940

- ▶ `diff()` on "difftime" object losing unit
- ▶ involves S3 dispatch/methods
- ▶ fix is small

https://bugs.r-project.org/bugzilla/show_bug.cgi?id=17124

by Alex Bertram

- ▶ Present 3.3.2
- ▶ about `eval(substitute(...))`, environments; patch proposal in 2016, analysis by Sebastian Meyer in 2020.

Currently Unfixed

https://bugs.r-project.org/bugzilla/show_bug.cgi?id=18140

[.data.frame: subsetting data frame with factor column: additional class not stripped

- ▶ new, from 1 Jul 2021
- ▶ can you reproduce?
- ▶ is this a bug? If yes, *where*, if not, *why* ?
- ▶ what do the docs say?

https://bugs.r-project.org/bugzilla/show_bug.cgi?id=18143 by Sebastian Meyer

debugcall() example fails after loading mgcv (or survival)

- ▶ very new bug report from Tue, July 6, 2021 (yesterday!)
- ▶ Have seen `debugcall()` above (!).

Other

https://bugs.r-project.org/bugzilla/show_bug.cgi?id=18041

- ▶ `checkRdaFiles()$version` bug, short and simple
- ▶ Needs anything between R 3.5.0 and 4.0.3 to reproduce the problem.

Recent issues, still visible in *current* R (4.0.x, 4.1.0)

substring(.., last=*) discussion / report on the R-devel mailing list

- ▶ Search for “Should last default to” / “for substring()” in the [R-devel list archives](#)
- ▶ Look at the first 2–3 mails; what do you think? how would you solve it?
- ▶ Maybe look at the svn rev 80536 (June 21) which fixes the allocation bug *and* a wrong *comment* in the C source (main/character.c)

```
svn ci -m'update with docs (WRE): max nchar() = 2^32-1; thanks to Brodie (
src/include/R_ext/RS.h src/main/character.c
```

https://bugs.r-project.org/bugzilla/show_bug.cgi?id=18123 by Michael Chirico

Fixed by MM, in svn rev 80537

```
svn ci -m'grDevices/src/cairo/* messages are now up for translation'  
doc/NEWS.Rd src/library/tools/R/translations.R
```

C code: https://bugs.r-project.org/bugzilla/show_bug.cgi?id=18129 by Michael Chirico

- ▶ Code/Bug analysis – what can you say?
- ▶ between C code and documentation
- ▶ Fixed by MM, in svn rev 80542

```
svn ci -m'Fix PR#18129 (M.Chirico) to use _G() macro consistently in RGui'  
src/extra/graphapp/metafile.c src/extra/graphapp/printer.c
```