

# labeleR: an R package to optimize the generation of collection labels and scientific documents

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## Summary

`labeleR` is an R package designed to automate the creation of collection labels and documents for scientific events. It simplifies repetitive and time-consuming tasks, offering a practical alternative to manual or costly tools. With `labeleR`, users can generate a wide variety of customizable PDF documents that can also be automatically emailed.

The package provides a set of functions classified into two groups: scientific collections (e.g. labels for herbarium or insects) and scientific events organization (e.g. personal badges, abstract books and certificates of attendance and participation). Starting from a tidy dataset, users can easily customize content, incorporate QR codes, logos, images, and edit their own templates. `labeleR` transforms tedious and repetitive workflows into an efficient, reproducible process, contributing to greater scientific productivity. The package is available under an open-source license and can be freely downloaded from CRAN or the GitHub repository (<https://ecologyr.github.io/labeleR/>).

## Statement of need

The management and design of scientific labels and event documents is a time-consuming task. Large-scale label generation tools for herbarium and scientific collections (used by institutions such as museums or botanical gardens) are often paid and proprietary software (e.g. “BRAHMS” (2025) “IrisBG” (2024)). Microsoft Excel-Word integration through mailing lists is commonly used at a smaller scale, although still involving paid software with limited large database management capacity. Most free alternatives are not open-source, require installing a program with limited customization, and are often only compatible with Windows operating system (e.g. Pando, Lujano, & Cezón (2019) “pLabel” (2020)), or designed for very specific purposes (e.g. “EntomoLabels” (2022) for insects, “LichenLabler” (2025) for lichens or Zhang, Zhu, Liu, & Fischer (2016) for plant vouchers). Additionally, credentials and certificates for scientific events are either created manually one at a time, through paid online servers, or by hiring an event organization company. To our knowledge, there are no free, customizable tools for the bulk production and distribution of these documents. `labeleR` fills this gap facilitating the creation of scientific collection labels, conference badges, attendance and participation certificates, and abstract books, among others.

## Package description

The `labeleR` package builds upon the `RMarkdown` ecosystem (Allaire et al. (2024)) to generate PDF documents from a tidy data frame in R (Figure 1). `labeleR` functions include three types of arguments: (1) R instructions, such as the data object, paths and file name of the rendered document; (2) “fixed” arguments, text that remains constant across output documents (e.g. event name or image path); (3) “variable” arguments, linked to columns in the dataframe, thus changing between documents (e.g. taxonomic names in labels or attendee names in certificates). A QR code can be included either through a fixed argument

or a variable argument, without the need for external software. Users can also edit and adapt the default RMarkdown templates provided by the package for their own purposes.

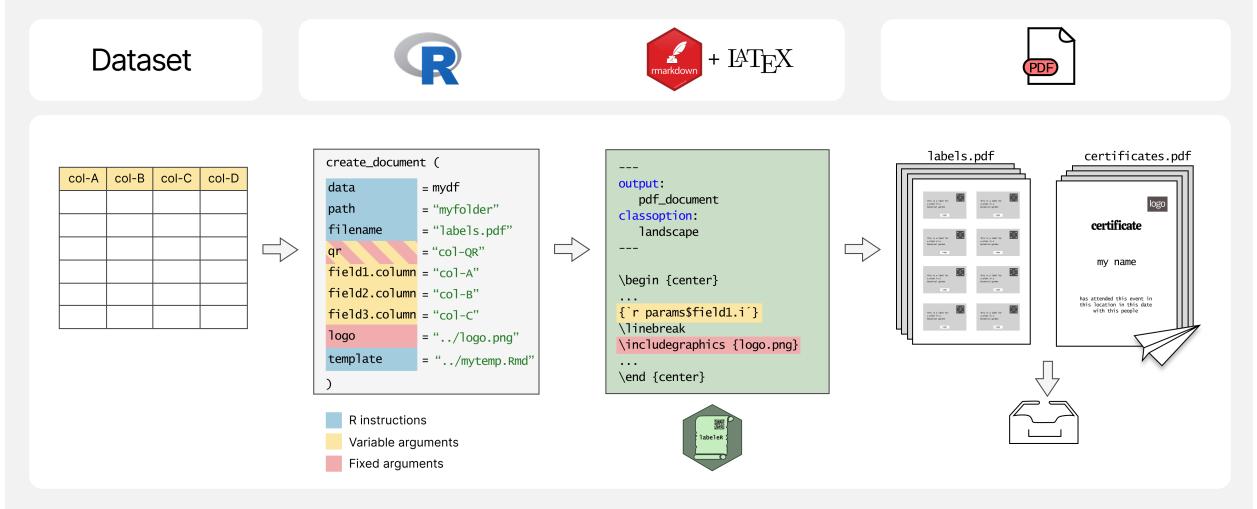


Figure 1: Figure 1. **labeleR** package workflow. Information stored in a dataset passes through an R function into a parameterized RMarkdown file using LaTeX syntax, and is then rendered as PDF. **labeleR** functions accept three argument types: R instructions which specify the dataset, paths to images or add custom templates (in blue); fixed arguments, such as titles or subtitles (in red), and variable arguments, linked to columns of the dataset (in yellow). Users work directly on R to introduce the parameters, while **labeleR** works in the background with markdown and latex to produce the results. Output PDF documents can be automatically emailed to participants.

## Documents that can be generated with **labeleR**

### Labels for collections

Appropriate labelling of samples is a fundamental step of the scientific process (i.e., labelling test tubes in laboratories, storing animal or plant materials or displaying collections in museums or botanical gardens). A user-friendly bulk rendering tool is vital for efficiently producing crafted, uniform labels in a reproducible manner. We present three label types: “herbarium” (most complex), “collection” (most aesthetic) and “tinylabes” (compact and simplified, for small insect collections) (Figure 2). These labels can include QR codes (e.g. links to websites, images, or identification codes) without additional tools, making it easy to quickly access and link to external information.

### Documents for scientific events

Scientific events often host a high number of participants, and require the creation of identification badges, abstract books and certificates for attendees and participants. With **labeleR**, templates and code can be customized according to the event, and bulk rendering significantly decreases the amount of time invested in the creation of such materials. Manually delivering attendance and participation certificates is highly time-consuming, but **labeleR** functions allow users to automatically send individual documents to email addresses stored in a column.

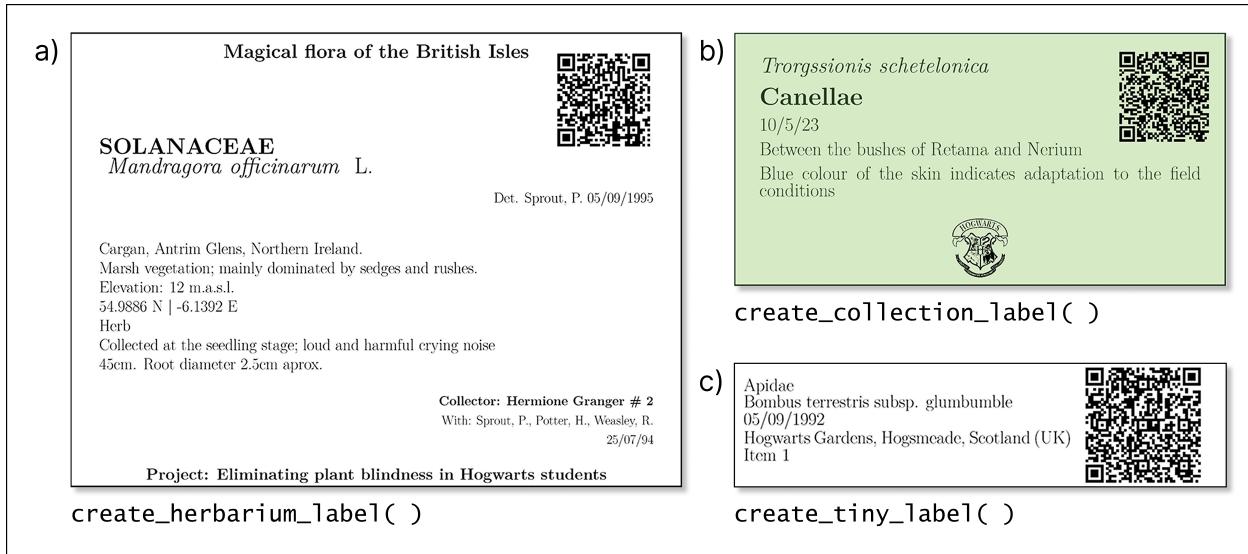


Figure 2: Figure 2. Examples of the outcomes from each label-related function in `labeleR`. a) Herbarium label: for stored plant vouchers; includes fixed fields (title, subtitle) and variable fields (e.g. taxon, date, coordinates, elevation). The family field is by default capitalized and bold, and species name italic. Size: 4 labels/page. b) Collection label: includes variable fields (first field in italics, second in bold), a customizable logo, font and background colors. Size: 8/page. c) Tinylabel: a simplified collection label with five fields. Size: 16/page. All three functions can include an optional QR code.

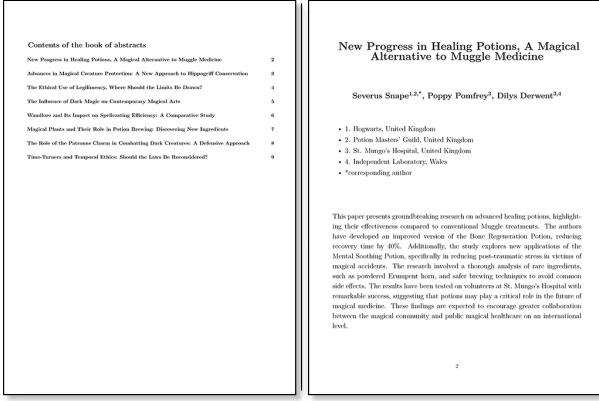
## Further applications

The `labeleR` philosophy is quite simple: creating multiple documents with a common design from a dataset containing the required information. It offers a modular structure that allows for customization and extension for new applications. For instance, the newly added `create_multichoice` function generates multichoice tests randomizing the order of questions and possible answers from a given table (question bank). New developments will happen in the GitHub repository (<https://github.com/EcologyR/labeleR>) and eventually pushed to CRAN. User feedback and code contributions are welcome in the same repository to keep `labeleR` as an open and dynamic tool.

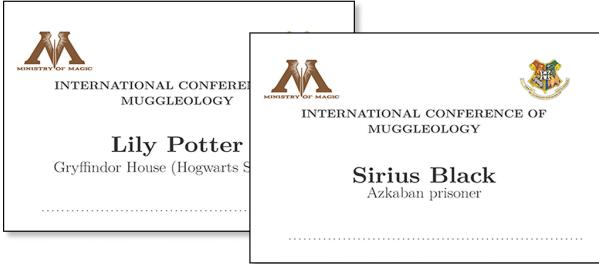
## Acknowledgements

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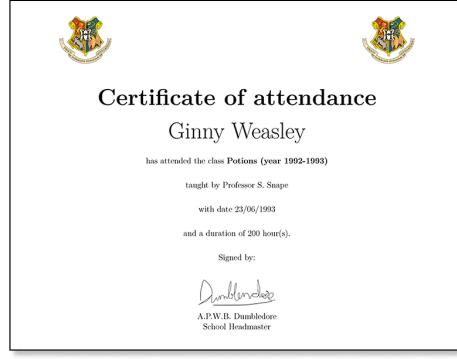
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a) 

```
create_abstractbook()
```

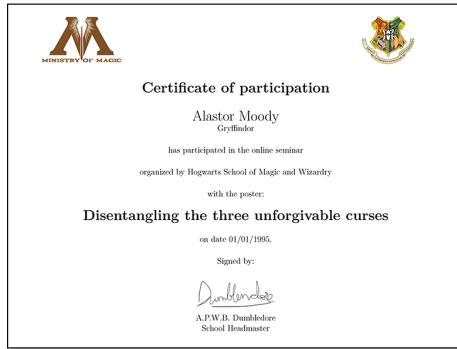
b) 

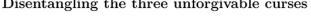
```
create_badge()
```

c) 

```
Certificate of attendance  
Ginny Weasley  
has attended the class Potions (year 1992-1993)  
taught by Professor S. Snape  
with date 23/06/1993  
and a duration of 200 hour(s).  
Signed by:  
  
A.P.W.B. Dumbledore  
School Headmaster
```

```
create_attendance_certificate()
```

d) 

```
Certificate of participation  
Alastor Moody  
Gryffindor  
has participated in the online seminar  
organized by Hogwarts School of Magic and Wizardry  
with the poster:  
  
Disentangling the three unforgivable curses  
on date 01/01/1995.  
Signed by:  
  
A.P.W.B. Dumbledore  
School Headmaster
```

```
create_participation_certificate()
```

Figure 3: Figure 3. Examples of outcomes from each event-related function in ‘labeleR. a) Abstract book: creates pages with title, authors, affiliations and abstract (variable fields) and can include a table of contents and front page. b) Badges: include name, affiliation, a fixed field for the title, the option to add two images on top, and a dashed line at the bottom for additional hand-written information. c) Attendance certificate: attendee name is a variable field, while event name, signer, and date are fixed fields. d) Participation certificate: includes name, affiliation and title of the communication, and several fixed fields. Both certificate functions allow two images on top, a signature at the bottom, and offer Spanish and English templates.

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## References

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