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# Sustaining research software: write less software

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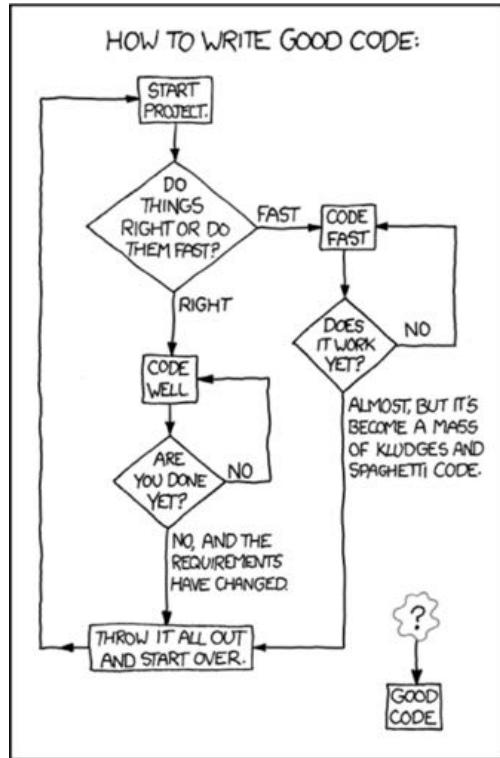
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# Research software balancing act



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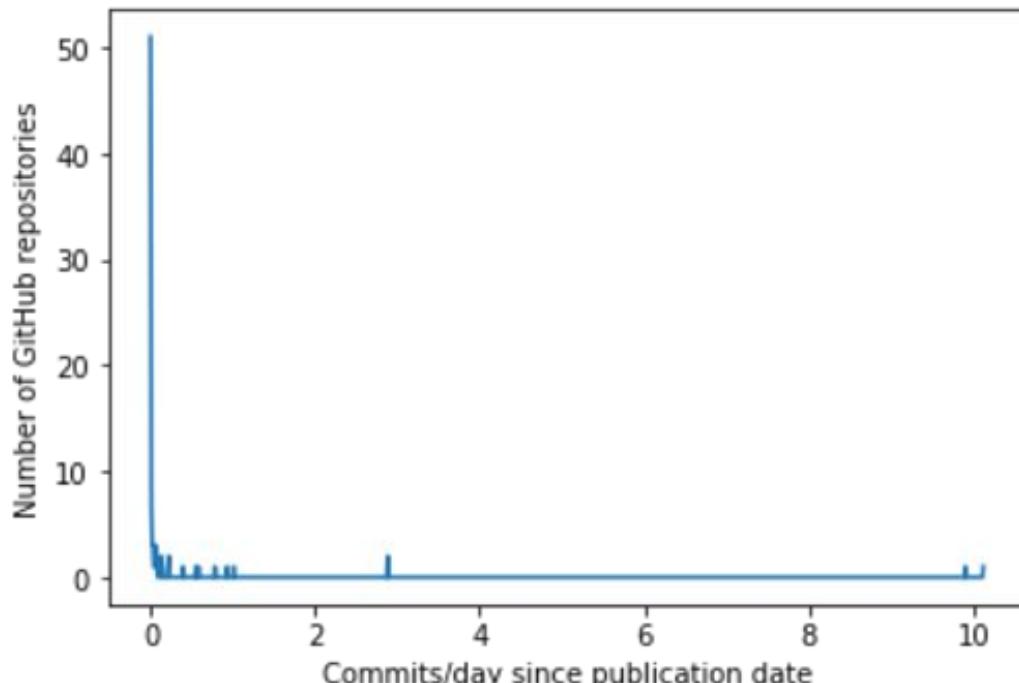
- Initially, key goal is getting a result
- Then it's a result others trust or a result faster than others can
- Sustainability comes *after* that (if you get there)



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# Published, then forgotten

Does software referenced in publications get updated?



- Most software referenced in papers never updated after publication
  - Why would others use this?

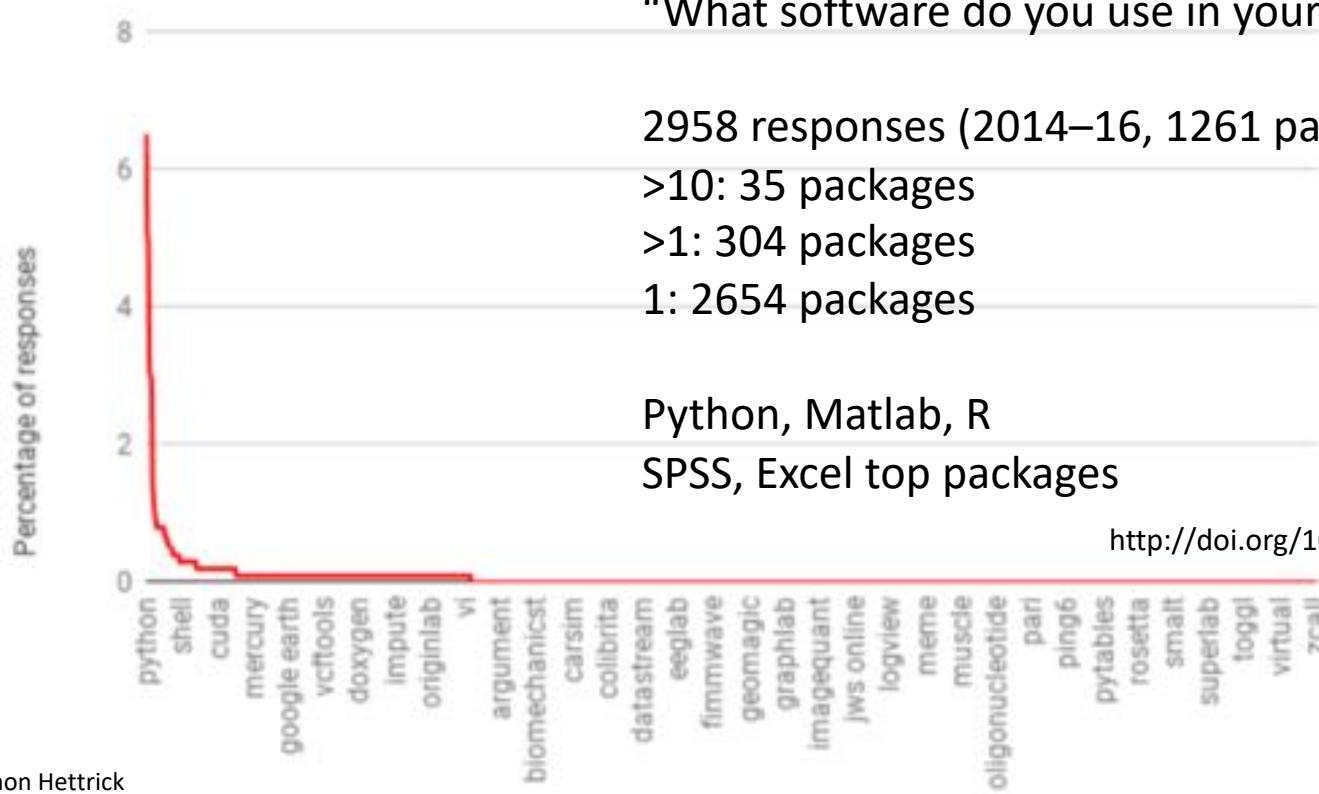
How reusable is software mentioned in Open Access papers?  
An empirical study using code-cite DOI: 10.5281/zenodo.1209095



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# Long, long, long tail

“What software do you use in your research?”



2958 responses (2014–16, 1261 participants)

>10: 35 packages

>1: 304 packages

1: 2654 packages

Python, Matlab, R

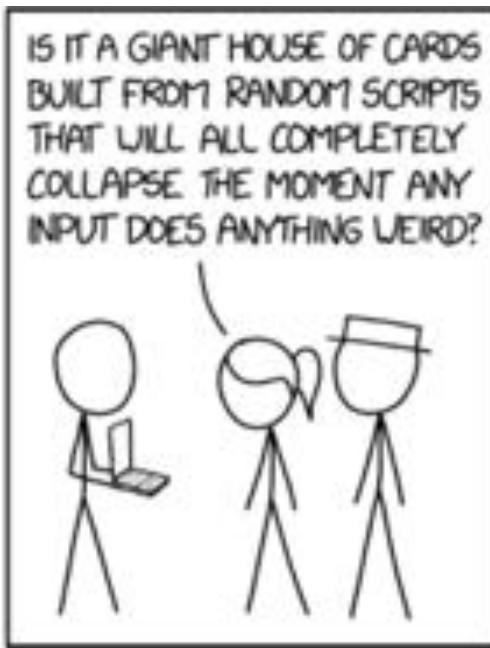
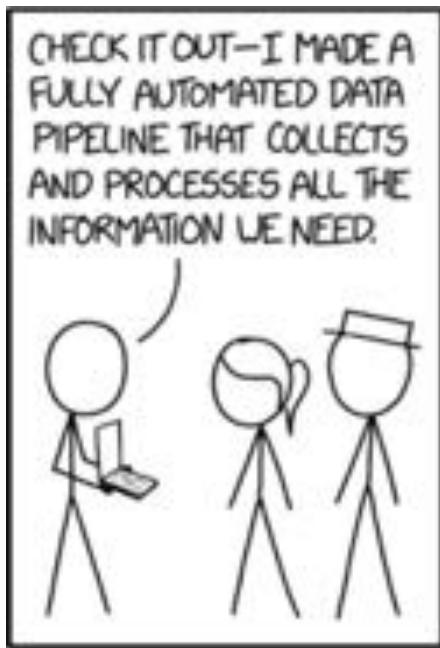
SPSS, Excel top packages

<http://doi.org/10.5281/zenodo.60276>

# Science is “just” a data pipeline



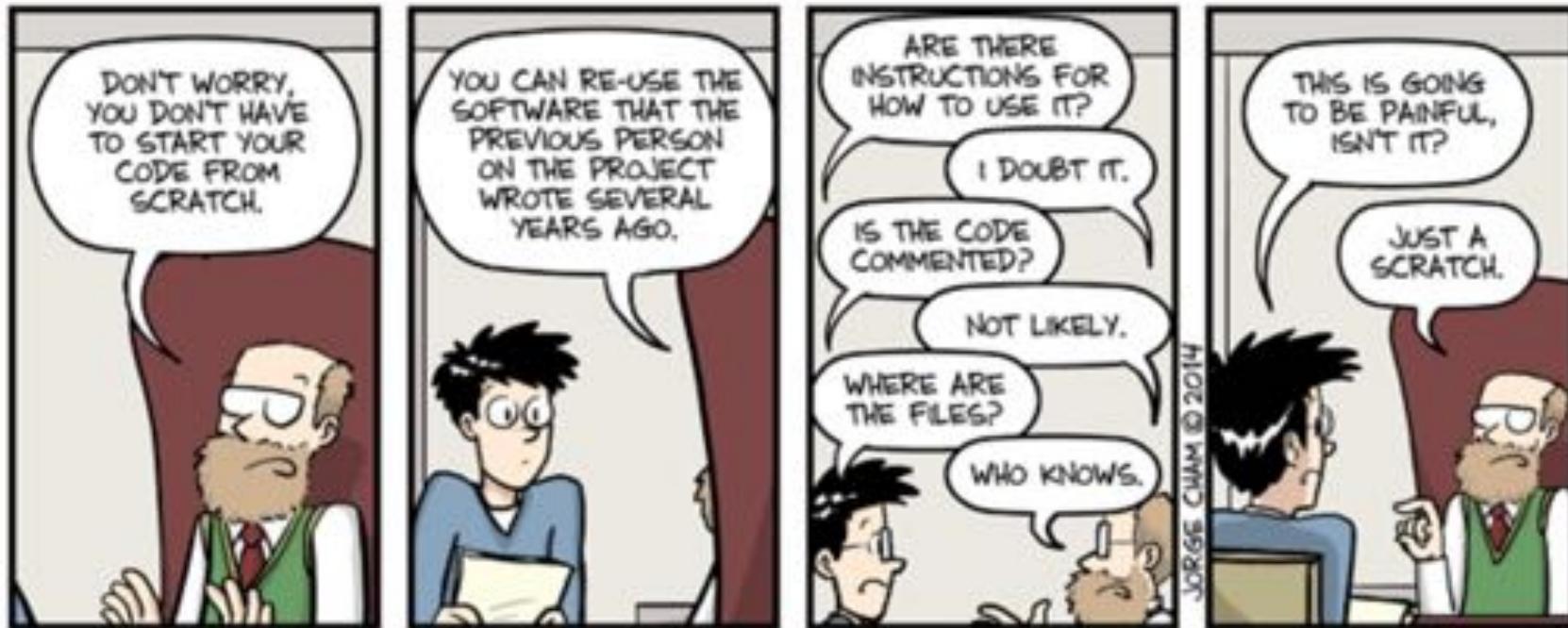
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# “Sustainability” is top down



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<http://phdcomics.com/comics.php?f=1689>

Piled Higher and Deeper" by Jorge Cham  
[www.phdcomics.com](http://www.phdcomics.com)

# Observations



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- Incentivise researchers to write the smallest possible amount of new code
  - Encourage building on and extending existing software / platforms (e.g. through grant guidelines, make it easier to discover software that meets needs)
  - Treat these platforms as infrastructure, fund maintenance through “taxation”
  - Use this to fund research software engineers to focus care on established software, consult on new software



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# Additional slides



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# Modern Research Practice

Picture of Otto Stern courtesy of  
Emilio Segré Visual Archives



# Foundations of Research



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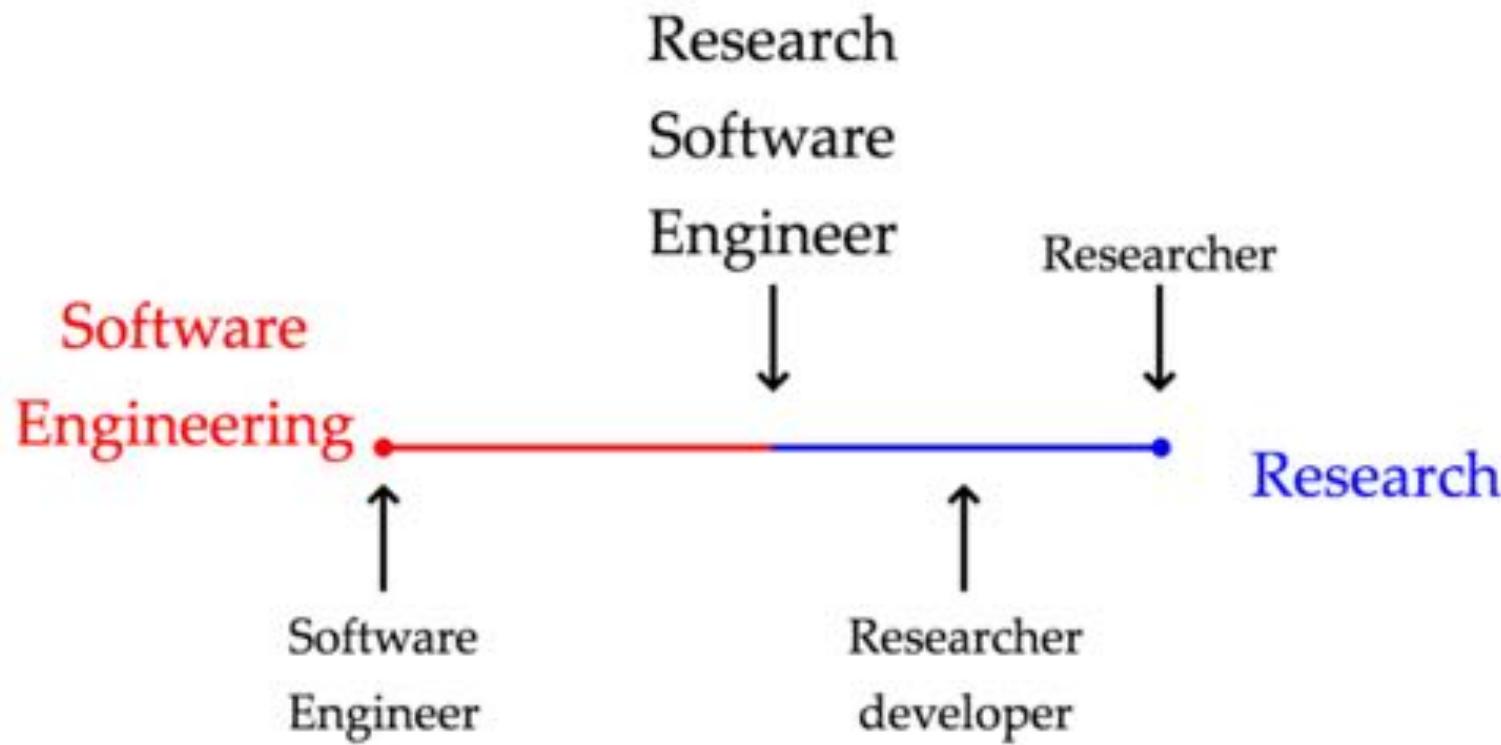
“Authentic leaders are not made nor are they born; they are enabled or disabled by the organizations in which they work.”

— David Leach, MD, Past Executive Director, ACGME



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# Research Software Engineers



# Growth of RSE Community



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## RSE Groups

- 📍 Alan Turing Institute
- 📍 University of Bath
- 📍 University of Birmingham
- 📍 University of Bristol
- 📍 University of Cambridge
- 📍 Culham Centre for Fusion En...
- 📍 Imperial College London
- 📍 Francis Crick Institute
- 📍 University of Leeds
- 📍 University of Leicester
- 📍 The University of Manchester
- 📍 Newcastle University
- 📍 The University of Sheffield
- 📍 University of Southampton
- 📍 University College London
- 📍 EPCC
- 📍 Daresbury Laboratory
- 📍 Oxford eResearch Centre
- 📍 Software Engineering Suppo...





# RSEs are worldwide

- Wants to work in a research environment
- Wants to advance research
- Wants to develop software

Country	Gender	PhDs	Background	Reason to work
Canada	n/a	45%	IT	n/a
Germany	83% male	48%	Physics	Research environment
Netherlands	63% male	56%	Comp. sci.	N/A
UK	84% male	67%	Comp. sci./physics	Research environment
USA	82% male	60%	Comp. sci.	Advance research
South Africa	92% male	68%	Physics	Research environment

[github.com/softwaresaved/international-survey/tree/master/analysis](https://github.com/softwaresaved/international-survey/tree/master/analysis)



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# Communities of Practice

# Communities of Practice



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- Domain: A domain of knowledge creates common ground, inspires members to participate, guides their learning and gives meaning to their actions
- Community: The notion of a community creates the social fabric for that learning. A strong community fosters interactions and encourages a willingness to share ideas.
- Practice: While the domain provides the general area of interest for the community, the practice is the specific focus around which the community develops, shares and maintains its core of knowledge.

Wenger, Etienne; McDermott, Richard; Snyder, William M. (2002). *Cultivating Communities of Practice* (Hardcover). Harvard Business Press; 1 edition. ISBN 978-1-57851-330-7.

# Cultivating successful CoPs



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- Design the community to evolve naturally
- Create opportunities for open dialog within and with outside perspectives
- Welcome and allow different levels of participation
- Develop both public and private community spaces
- Focus on the value of the community
- Combine familiarity and excitement
- Find and nurture a regular rhythm for the community

Wenger, Etienne; McDermott, Richard; Snyder, William M. (2002). *Cultivating Communities of Practice* (Hardcover). Harvard Business Press; 1 edition. ISBN 978-1-57851-330-7.



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# Examples of CoPs



WORKING TOWARDS SUSTAINABLE  
SOFTWARE FOR SCIENCE:  
PRACTICE AND EXPERIENCES



<https://cookbook.carpentries.org/>



**Research Platform Services**  
@ResPlat



Lots of old friends and new faces at a packed #HackyHour today!

5:36 AM - Nov 19, 2015

3 See Research Platform Services's other Tweets

<http://melbourne.resbaz.edu.au/HackyHour>

Software Sustainability Institute

<https://www.software.ac.uk/index.php/blog/2018-05-18-code-review-academia>

<http://collections.plos.org/ten-simple-rules>