

# CODECHECK: An Open Science initiative for the independent execution of computations underlying research articles during peer review to improve reproducibility

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HTML Slides: <http://bit.ly/codecheck21> (CC-BY 4.0 license)

# Paper

These slides are to accompany our paper in F1000 Research:

<https://f1000research.com/articles/10-253/>

## Declarations

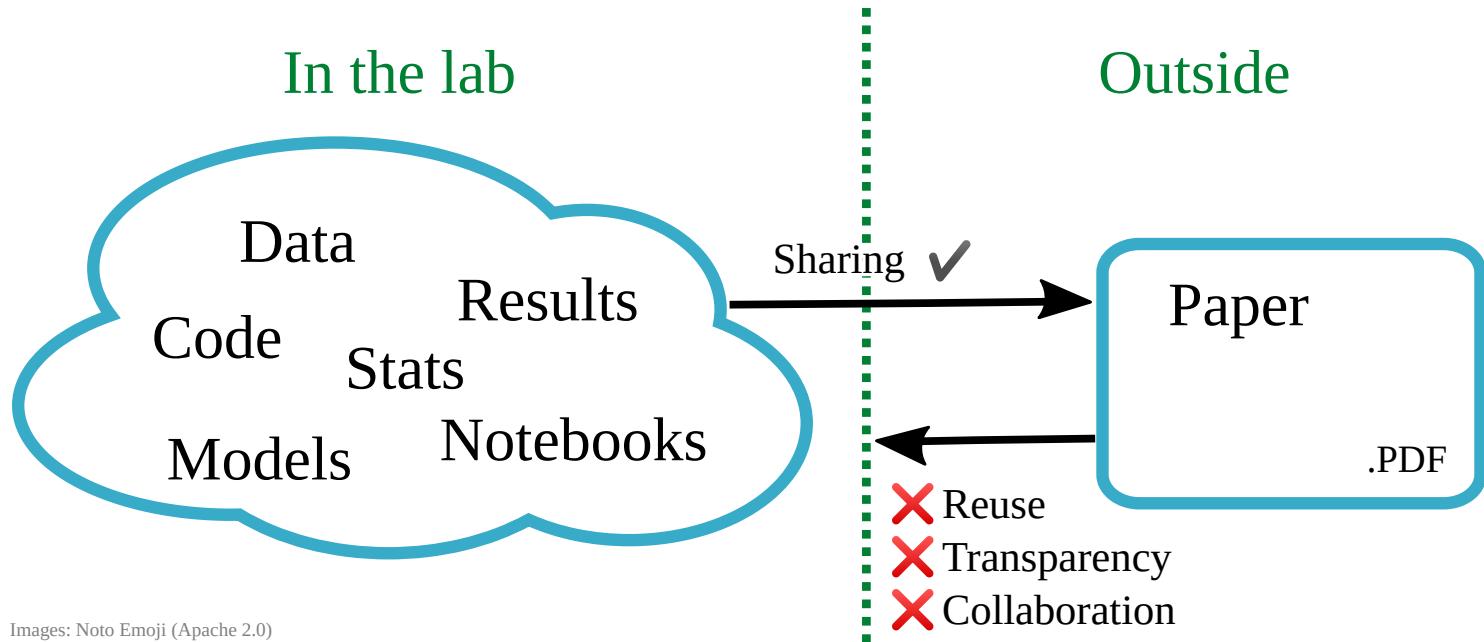
Affiliate editor of *bioRxiv*; editorial board of *Gigabyte*.

## Acknowledgements

Mozilla mini science grant, UK Software Sustainability Institute.

Editors @ *Gigascience*, *eLife*, *Scientific Data*.

# Premise



Images: Noto Emoji (Apache 2.0)

We should be sharing material on the left, not the right.

"Paper as advert for Scholarship" (Buckheit & Donoho, 1995)

# Approaches to code sharing

- Barnes (2010)

Published online 13 October 2010 | *Nature* **467**, 753 (2010) | doi:10.1038/467753a

Column: World View

## **Publish your computer code: it is good enough**

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**Freely provided working code — whatever its quality — improves programming and enables others to engage with your research, says Nick Barnes.**

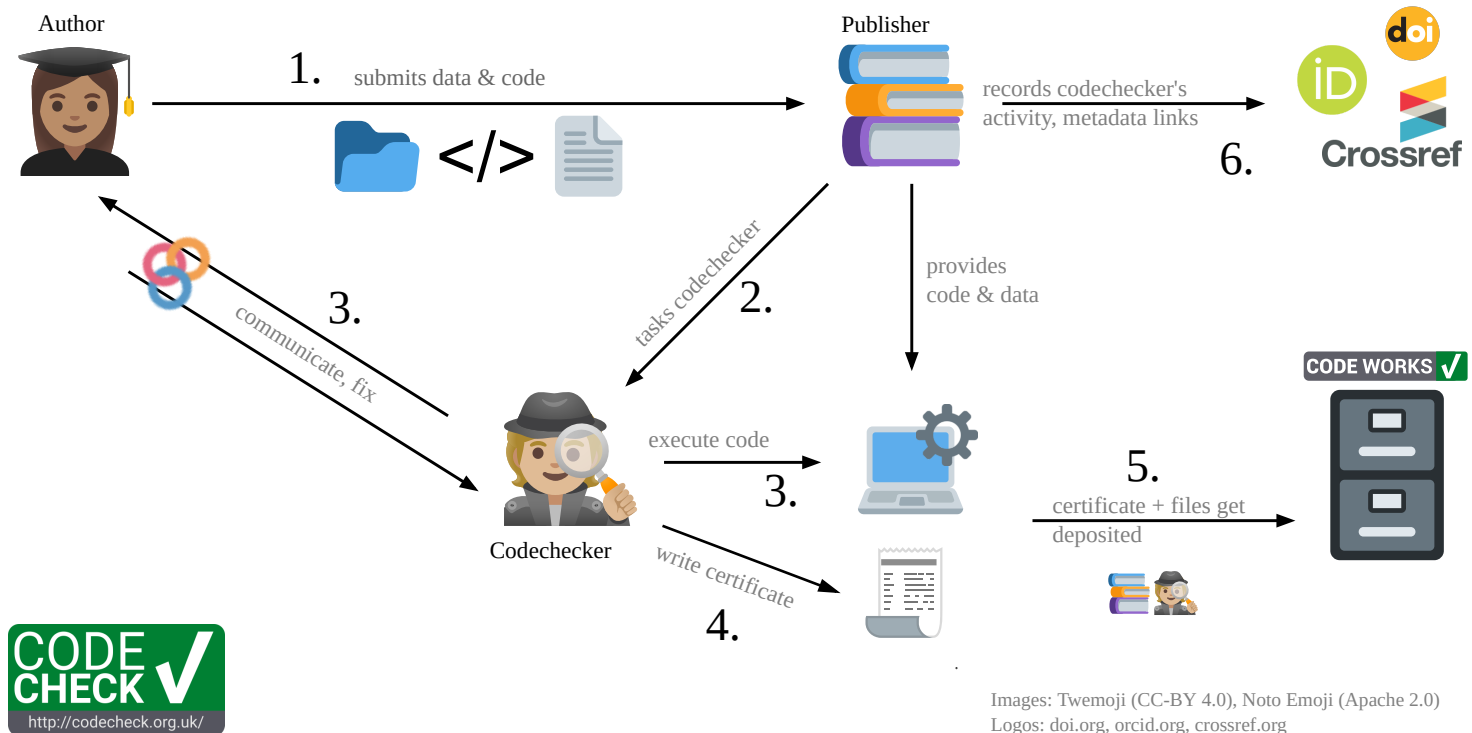
Nick Barnes

- Informal 'code buddy' system
- Community-led *research compedia*.
- Code Ocean ([Nature trial](#))
- Certify reproducibility with confidential data (CASCAD) ([Pérignon et al 2019](#))

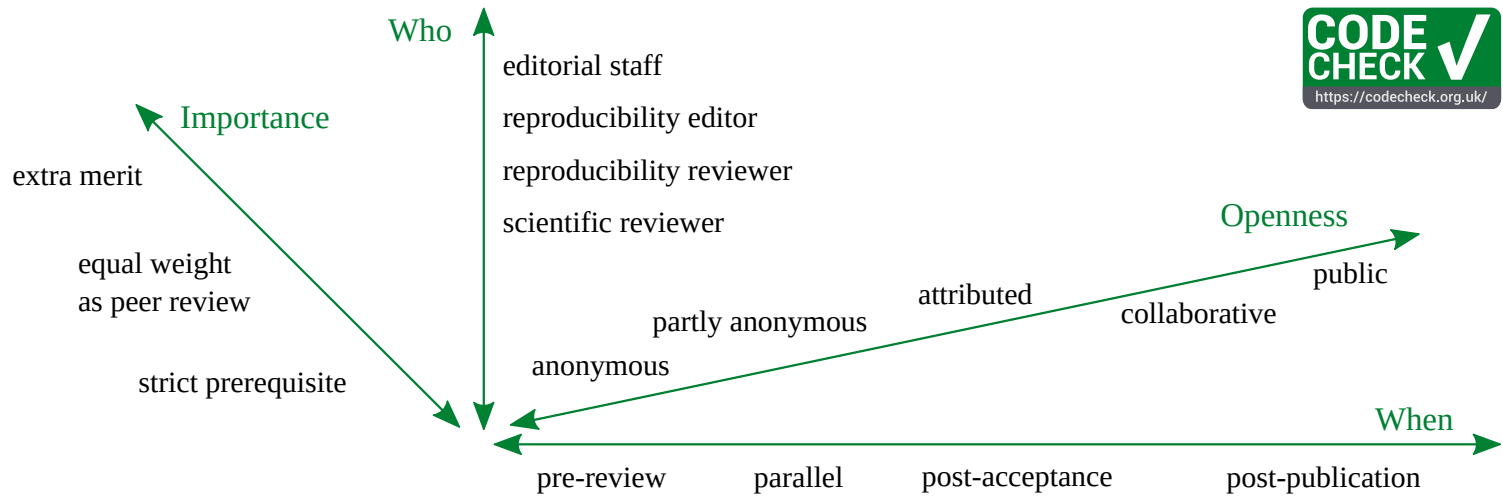
# The CODECHECK philosophy

- Systems like Code Ocean set the bar high by "making code reproducible *forever for everyone*".
- CODECHECK simply asks "was the code reproducible *once* for *someone* else?"
- We check the code runs and generates the expected number of output files.
- The contents of those output files are not checked, but are available for others to see.
- The validity of the code is *not* checked.

# CODECHECK process



# Variations in a codecheck



# Core principles

1. Codecheckers record but don't investigate or fix.
2. Communication between humans is key.
3. Credit is given to codecheckers.
4. Workflows must be auditable.
5. Open by default and transitional by disposition.



# Who does the work?

1. **AUTHOR** provides code/data and instructions on how to run.
2. **CODECHECKER** runs code and writes certificate.
3. **PUBLISHER** oversees process, helps depositing artifacts, and persistently publishes certificate.

# Who benefits?

1. **AUTHOR** gets early check that "code works"; gets snapshot of code archived and increased trust in stability of results.
2. **CODECHECKER** gets insight in latest research and methods, credit from community, and citable object.
3. **PUBLISHER** Gets citable certificate with code/data bundle to share and increases reputation of published articles.
4. **PEER REVIEWERS** can see certificate rather than check code themselves.
5. **READER** Can check certificate and build upon work immediately.

# Our register of certificates

<https://codecheck.org.uk/register/>

## CODECHECK Register

Certificate	Repository	Type	Issue	Report	Check date
2020-001	<a href="#">Piccolo-2020</a>	journal (GigaScience)	NA	<a href="http://doi.org/10.5281/zenodo.3674056">http://doi.org/10.5281/zenodo.3674056</a>	2019-02-14
2020-002	<a href="#">Reproduction-Hancock</a>	community	2	<a href="http://doi.org/10.5281/zenodo.3750741">http://doi.org/10.5281/zenodo.3750741</a>	2020-04-13
2020-003	<a href="#">Hopfield-1982</a>	community	1	<a href="https://doi.org/10.5281/zenodo.3741797">https://doi.org/10.5281/zenodo.3741797</a>	2020-04-06
2020-004	<a href="#">Barto-Sutton-Anderson-1983</a>	community	4	<a href="https://doi.org/10.5281/zenodo.3827371">https://doi.org/10.5281/zenodo.3827371</a>	2020-05-14
2020-005	<a href="#">Larisch-reproduction</a>	community	5	<a href="https://doi.org/10.5281/zenodo.3959175">https://doi.org/10.5281/zenodo.3959175</a>	2020-07-23
2020-006	<a href="#">Detorakis-reproduction</a>	community	6	<a href="https://doi.org/10.5281/zenodo.3948353">https://doi.org/10.5281/zenodo.3948353</a>	2020-07-16
2020-007	<a href="#">Hathway-Goodman-2018</a>	community	7	NA	NA
2020-008	<a href="#">covid-uk</a>	community (preprint)	8	<a href="http://doi.org/10.5281/zenodo.3746024">http://doi.org/10.5281/zenodo.3746024</a>	2020-04-09
2020-009	<a href="#">2020-cov-tracing</a>	community (preprint)	9	<a href="http://doi.org/10.5281/zenodo.3767060">http://doi.org/10.5281/zenodo.3767060</a>	2020-04-26
2020-010	<a href="#">covid-report9</a>	community (preprint)	14	<a href="https://doi.org/10.5281/zenodo.3865491">https://doi.org/10.5281/zenodo.3865491</a>	2020-05-29
2020-011	<a href="#">covid19model-nature</a>	community (in press)	18	<a href="https://doi.org/10.5281/zenodo.3893138">https://doi.org/10.5281/zenodo.3893138</a>	2020-06-13
2020-012	<a href="#">covid19model-report23</a>	community (preprint)	19	<a href="https://doi.org/10.5281/zenodo.3893617">https://doi.org/10.5281/zenodo.3893617</a>	2020-06-14
2020-013	<a href="#">Spitschan2020_bioRxiv</a>	community (preprint)	20	<a href="https://doi.org/10.5281/zenodo.3947959">https://doi.org/10.5281/zenodo.3947959</a>	2020-07-14
2020-014	<a href="#">Sadeh-and-Clopath</a>	community	21	<a href="https://doi.org/10.5281/zenodo.3967326">https://doi.org/10.5281/zenodo.3967326</a>	2020-07-28
2020-015	<a href="#">Liou-and-Bateman</a>	community	22	<a href="https://doi.org/10.5281/zenodo.3978402">https://doi.org/10.5281/zenodo.3978402</a>	2020-08-04
2020-016	<a href="#">OpeningPractice</a>	community	15	<a href="https://doi.org/10.5281/zenodo.3981253">https://doi.org/10.5281/zenodo.3981253</a>	2020-06-02

[CSV source](#) | [searchable CSV](#) | [JSON](#) | [Markdown](#)

Example certificate: <https://zenodo.org/record/3865491/files/codecheck.pdf>

# "It ain't pretty, but it works" (Hilda Bastian)



Sabine L. van Elstrand

@SabineLvE



Independent review [@StephenEglen](#) confirmed that [@MRC\\_Outbreak](#) team's [#COVID19](#) simulation is reproducible: thumbs up from code-checking efforts [@nature](#) [#COVID19](#) [#covid19science](#)



Thomas Angus/Imperial College London

Critiqued coronavirus simulation gets thumbs up...

Nature - Influential model judged reproducible — although software engineers called its code 'horrible' and 'a buggy mess'.

[nature.com](#)

7:47 PM · Jun 10, 2020



# Limitations

1. CODECHECKER time is valuable, so needs credit.
2. Very easy to cheat the system, but who cares?
3. Author's code/data must be freely available.
4. Deliberately low threshold for gaining a certificate.
5. High-performance compute is a resource drain.
6. Cannot (yet) support all thinkable/existing workflows and languages.

# Next steps

1. Embedding into journal workflows.
2. Training a community of codecheckers.
3. Funding for a codecheck editor.
4. Come and [get involved](#)

For more information please see: <http://codecheck.org.uk> and [#CODECHECK](#)