

Open Science in an Era of Big Data

- Gareth O'Neill
- GridKa School
- KIT in Karlsruhe
- 31 August 2018



The European Council of Doctoral
Candidates and Junior Researchers

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This talk

- Eurodoc=early-career researchers
- Issues for early-career researchers
- What is and why do Open Science?
- Open Science in an era of Big Data
- Where to learn about Open Science?



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Eurodoc=early-career researchers



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Eurodoc=early-career researchers

- Legal registered non-profit organisation
- Founded in 2002 and based in Brussels
- Federation of ± 30 national associations
- Run for and by early-career researchers
- For 1+ million early-career researchers
- Funded by member fees and volunteers



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Eurodoc=early-career researchers

We develop policy on topics for ECRs:

- Career Development
- Employment Status
- Interdisciplinarity
- Mobility
- Research Integrity
- Doctoral Training
- Equality
- Mental Health
- Open Science
- Research Quality

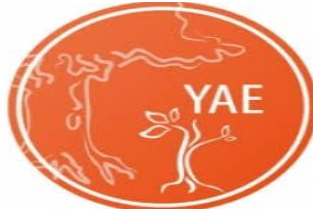
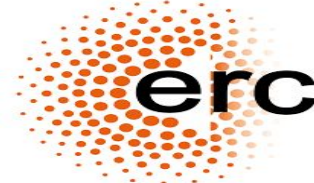


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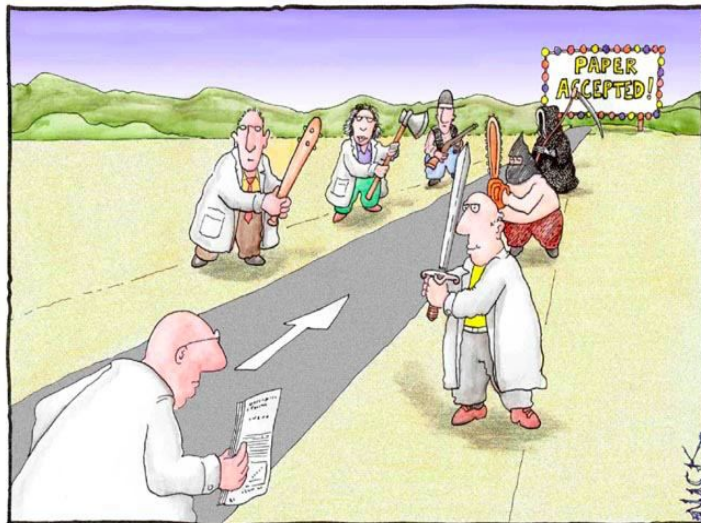


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Issues for early-career researchers



Most scientists regarded the new streamlined peer-review process as "quite an improvement."

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Issues for early-career researchers

- Need to prepare for (non)-academic careers

(46) I would like to work/continue working in academia (e.g. at a university or research institute).

		Answers	Ratio
strongly agree		323	35.77 %
agree		305	33.78 %
neutral		173	19.16 %
disagree		77	8.53 %
strongly disagree		25	2.77 %
No Answer		0	0 %

(56) My institution provides adequate career development. : via training courses

		Answers	Ratio
strongly agree		45	4.98 %
agree		224	24.81 %
neutral		237	26.25 %
disagree		201	22.26 %
strongly disagree		196	21.71 %
No Answer		0	0 %

(56) My institution provides adequate career development. : via career counselling

		Answers	Ratio
strongly agree		31	3.43 %
agree		134	14.84 %
neutral		227	25.14 %
disagree		256	28.35 %
strongly disagree		255	28.24 %
No Answer		0	0 %

(56) My institution provides adequate career development. : via contact with future employers

		Answers	Ratio
strongly agree		35	3.88 %
agree		121	13.4 %
neutral		259	28.68 %
disagree		227	25.14 %
strongly disagree		261	28.9 %
No Answer		0	0 %

O'Neill et al (2017)

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Issues for early-career researchers

- Urgent need to address mental health issues

Table 1. The prevalence of common mental health problems in PhD students (SJR) compared to the highly educated general population (HIS) in Flanders 2013: %, age and gender adjusted risk ratio's.

	SJR %	HIS %	Adj. RR ¹
Felt under constant strain	40.8	27.5	1.4
Unhappy and depressed	30.3	13.6	2.1
Lost sleep over worry	28.3	18.1	1.6
Could not overcome difficulties	26.1	12.0	2.4
Not enjoying day-to-day activities	25.4	13.1	2.2
Lost confidence in self	24.4	8.0	3.5
Not playing a useful role	22.5	9.2	2.3
Could not concentrate	21.7	10.7	1.9
Not feeling happy	21.2	11.1	2.2
Felt worthless	16.1	5.3	3.4
Could not make decisions	15.0	6.0	2.8
Could not face problems	13.4	4.3	3.7
Risk of a mental health disorder (GHQ4+)	31.8	14.0	2.4

¹ all RRs were significant at the p<0.001-level.

	Leiden University PhD candidates	PhD candidates in Flanders	Highly educated in Flanders
GHQ4+ / risk group	38.3	31.8	14.0
Well-being indicators (GHQ-12)			
Tension, feeling under constant pressure	46.8	40.8	27.2
Unhappy or depressed	32.8	30.3	13.7
Lack of sleep	32.8	28.3	18.1
Unable to overcome difficulties	31.5	26.1	10.7
Concentration problems	29.8	21.7	11.8
Not enjoying normal day-to-day activities	26.4	25.4	13.0
Lack of self-confidence	26.4	24.3	8.1
Not feeling happy	23.0	21.2	11.3
Sense of not playing a useful role	22.6	22.5	9.0
Difficulty in making important decisions	22.1	15.0	6.0
Not able to face problems	18.3	13.4	4.4
Feeling of worthlessness	14.0	16.2	5.4

Table 2: Mental well-being of Leiden University PhD candidates

[Levecque et al \(2016\)](#) | [Van der Weijden et al \(2017\)](#)

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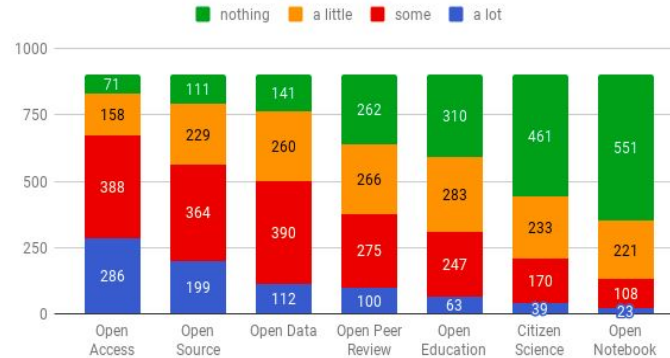
Issues for early-career researchers

- Need to train, support, and reward openness



Survey on Open Science and Career Development for Researchers 2017

Figure 8: R1-R2 Survey Respondents on 'How much Do you Know about Open Science?'



O'Neill et al (2017)

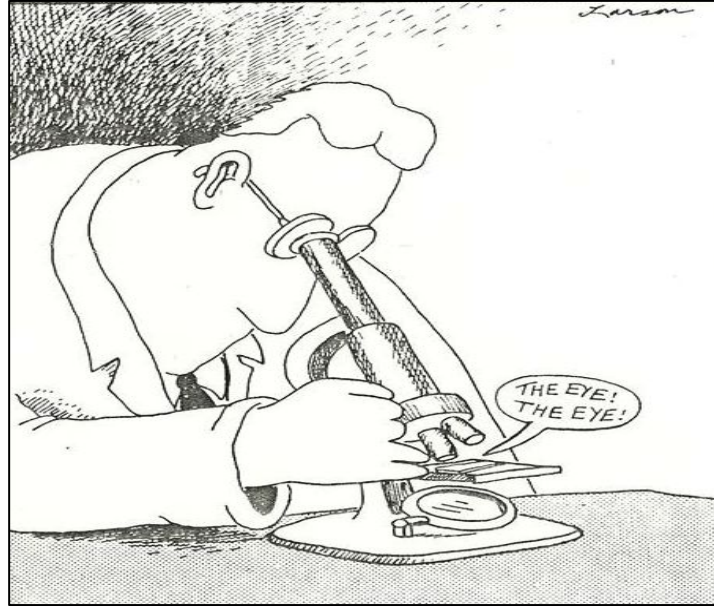


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What is and why do Open Science?



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What is and why do Open Science?



European Commission (2016)

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- OI more actors in the innovation process
- OS more open research via use of digital technology and tools
- OW more cooperation and societal impact



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What is and why do Open Science?

OPEN ACCESS Green Route Publishing Gold Route Publishing	OPEN DATA Findable Accessible Interoperable Reusable	OPEN EDUCATION Student materials Teacher materials
CITIZEN SCIENCE Citizen Engagement Science Communication	OPEN SCIENCE Gareth O'Neill [CC-BY]	OPEN EVALUATION Open Peer Review Alternate Metrics
OPEN SOURCE Open Hardware Open Software	OPEN METHODOLOGY Preregistration Open Notebook	OPEN LICENSING Attribution Share-Alike Commercial Derivative

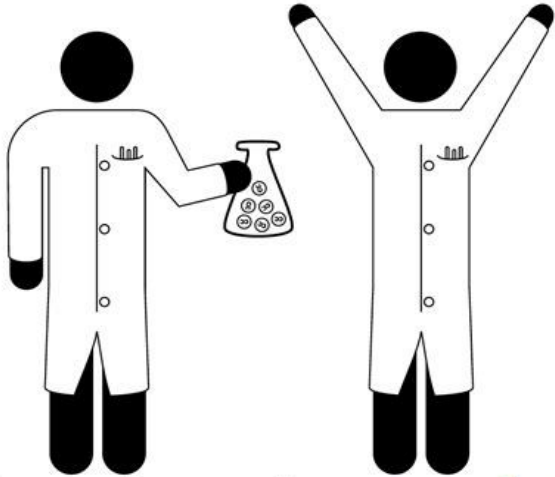


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What is and why do Open Science?



sharing is **car**ing

- opens up research
- increases access
- increases visibility
- increases impact
- pools resources
- fastens innovation
- as open as possible!

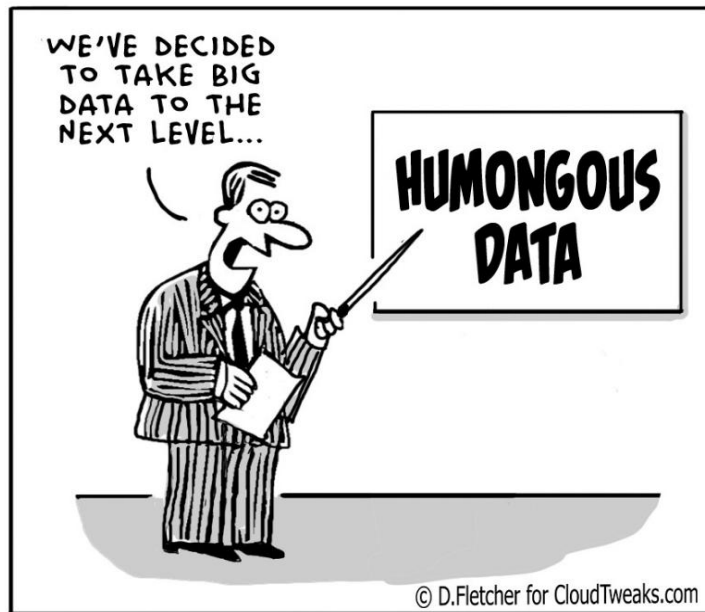


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Open Science in an era of Big Data

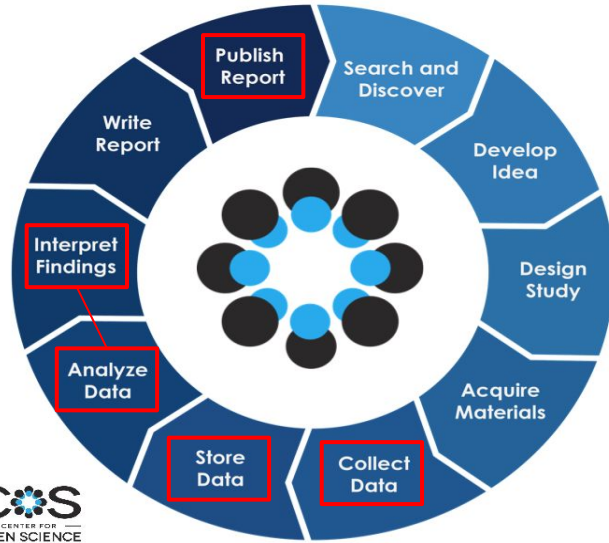


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Open Science in an era of Big Data



COS
CENTER FOR
OPEN SCIENCE

Open Science Framework

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- collect and tag big data with metadata
- store and curate big data for posterity
- analyse and logically interpret big data
- open up big data research outcomes

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Open Science in an era of Big Data

FAIR Data Principles

FINDABLE

- F1** = (Meta)data are assigned a globally unique and persistent identifier
- F2** = Data are described with rich metadata
- F3** = Metadata clearly and explicitly include the identifier of the data they describe
- F4** = (Meta)data are registered or indexed in a searchable resource

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FAIR Data Principles

ACCESSIBLE

A1 = (Meta)data are retrievable by their identifier using a standardised communications protocol

A1.1 = The protocol is open, free, and universally implementable

A1.2 = The protocol allows for an authentication and authorisation procedure, where necessary

A2 = Metadata are accessible, even when the data are no longer available

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FAIR Data Principles

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R1 = Meta(data) are richly described with a plurality of accurate and relevant attributes

R1.1 = (Meta)data are released with a clear and accessible data usage licence

R1.2 = (Meta)data are associated with detailed provenance

R1.3 = (Meta)data meet domain-relevant community standards

REUSABLE

FAIR Data Principles

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I1 = (Meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation

I2 = (Meta)data use vocabularies that follow FAIR principles

I3 = (Meta)data include qualified references to other (meta)data

INTEROPERABLE

FAIR Data Principles



FAIR Data Principles

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[EOSC](#) | [EOSCpilot](#) | [EOSC-hub](#)

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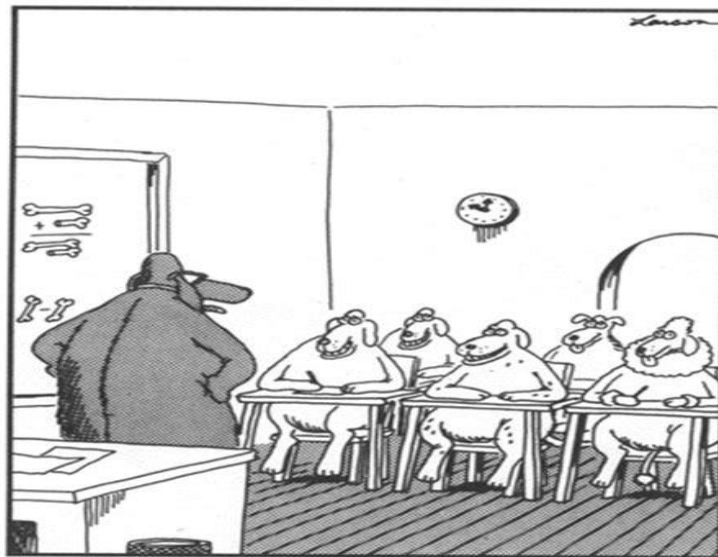
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- New European Open Science Cloud (EOSC)
= digital infrastructure for Open Science
- EOSCpilot for trials and governance
- single EOSC-hub of service providers

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Where to learn about Open Science?



"Well, here we go again. ... Did anyone here *not* eat his or her homework on the way to school?"

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Where to learn about Open Science?



- FOSTER portal offers many online training courses and badges
- Open Science MOOC is a collaborative set of online courses
- Ask for information at your institution!



[FOSTER](#) | [Open Science MOOC](#)

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Thank you for listening!

- Gareth O'Neill - President of Eurodoc



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