

The way forward:

teaching and learning traits in a FAIR Open Science world

ESA, August 9th, 2023

Vigdis Vandvik

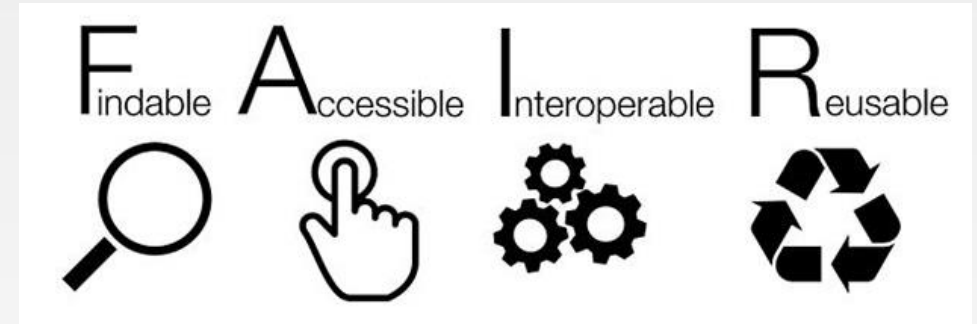
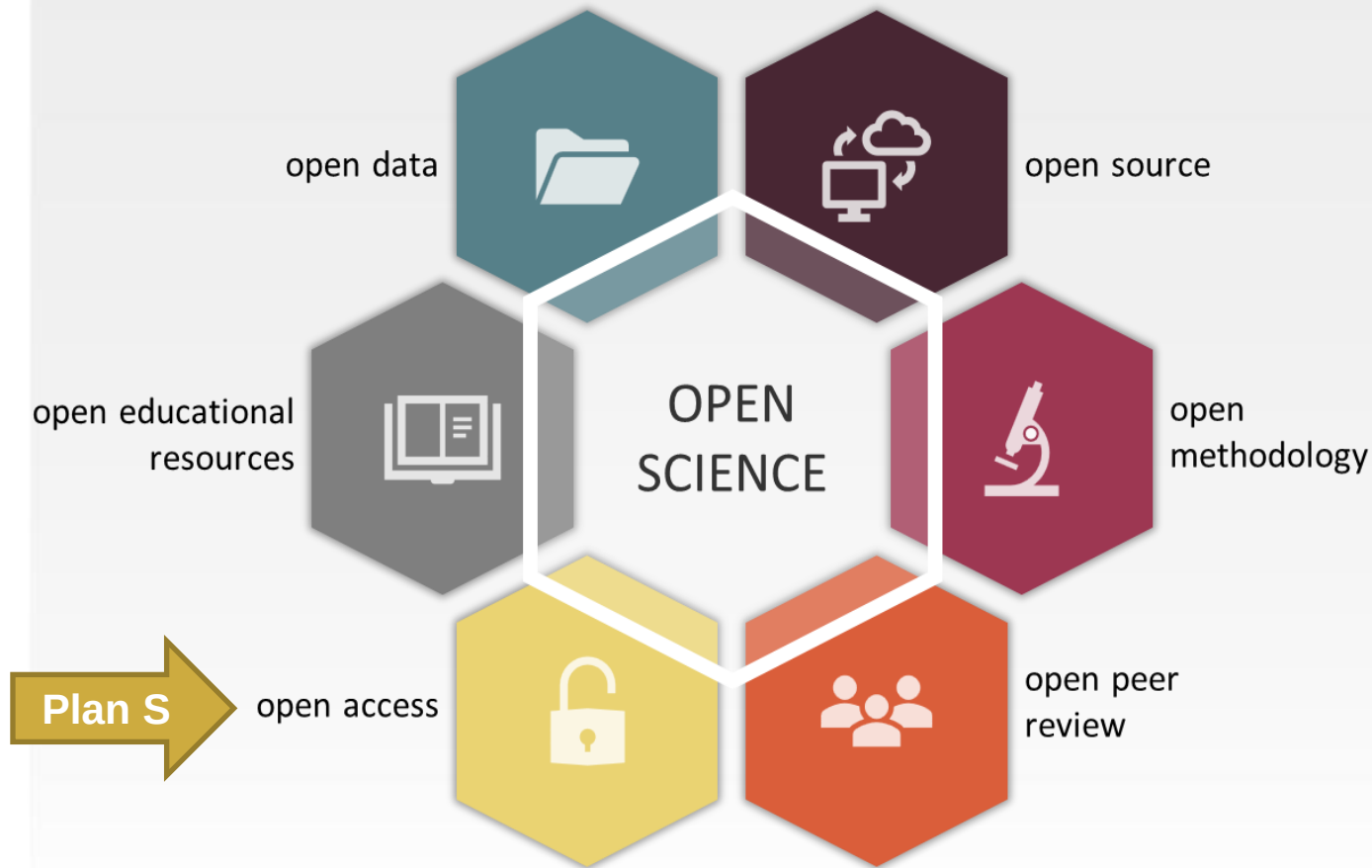
Brian J. Enquist, Aud H. Halbritter, Brian S. Maitner, Sean T. Michaletz, Richard J. Telford
... and 134 other PFTC instructors and participants...

UNIVERSITY OF BERGEN

@vvandvik @PFTCourses

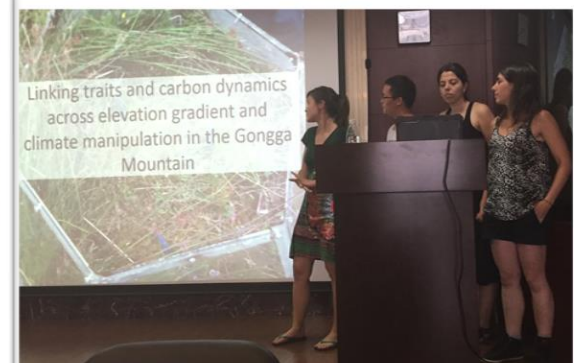


Traits in the evolving science landscape..



(Gallagher *et al.* 2020, Wilkinson *et al.* 2016)

Opportunity # 1: A trip to China...



Mt. Gongga, Sichuan, China, 2015

Plant Functional Traits Courses

Hands-on training in Plant Functional Traits ecology

Select Course:

All

☒ All ☐ Instructors ☐ Students

Country	Number of Participants
 United States	37
 Norway	33
 United Kingdom	12
 China	8
 Peru	7
 Canada	5
 Denmark	5
 Chile	4
 Sweden	4
 Argentina	3
 Brazil	3
 Czech Republic	3
 Australia	2

140

Participants



67

Institutions



25

Countries



33

Nationalities

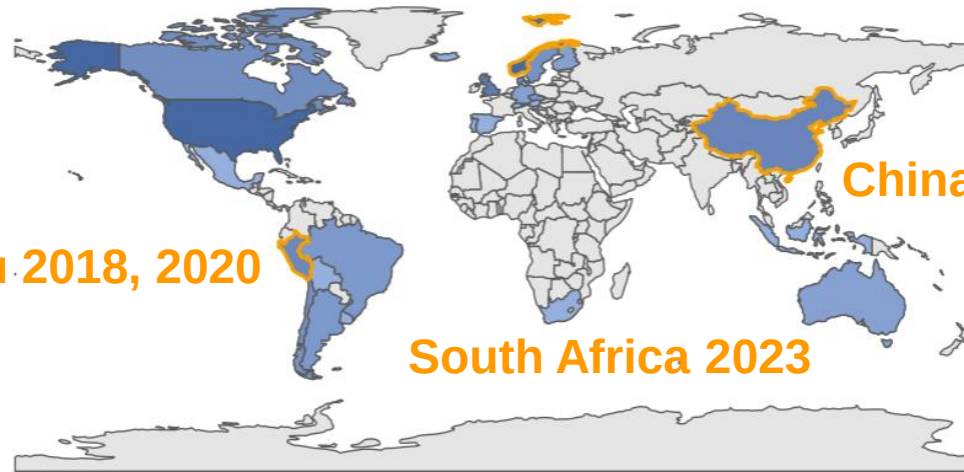


Norway 2022 Svalbard 2018

Peru 2018, 2020

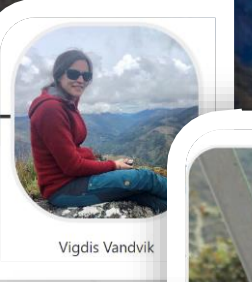
South Africa 2023

China 2015, 2016



Number of Participants

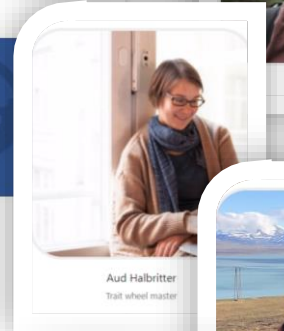
<https://plantfunctionaltraitscourses.w.uib.no/>



Vigdis Vandvik



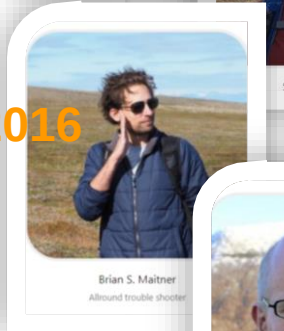
Brian J. Enquist



Aud Halbritter
Trail wheel master



Sean T. Michaletz

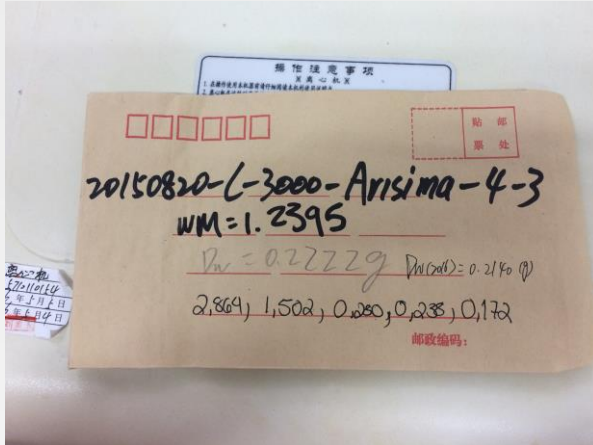


Brian S. Maitner
Allround trouble shooter

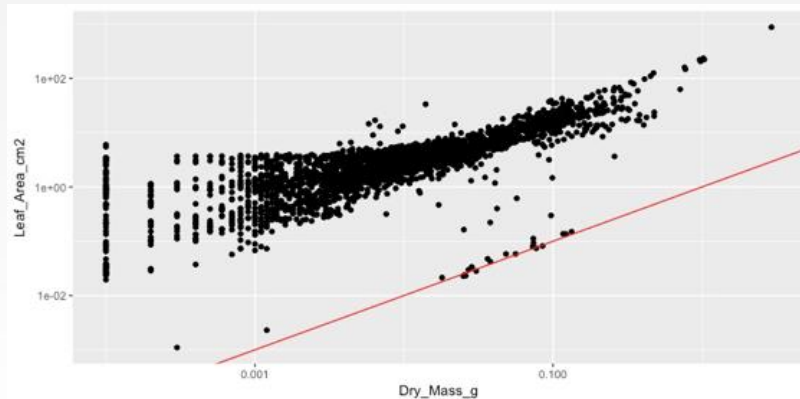


Richard J. Telford
Data wizard

Challenge #1: Collect, curate, document, quality, reproducible data



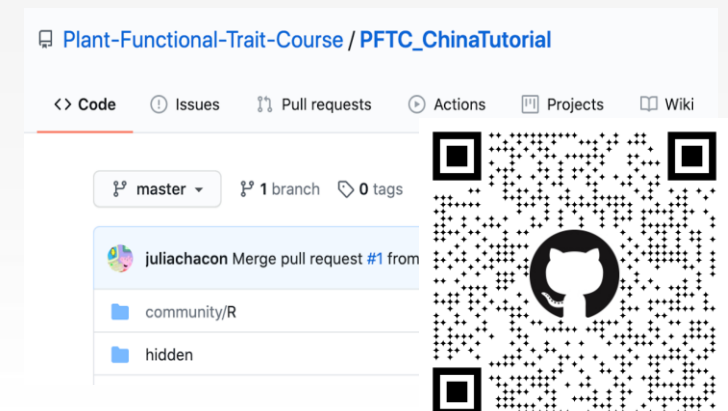
COLLECTION DAY:	ABC1234
SITE:	
ELEVATION:	m a.s.l.
GENUS:	
SPECIES:	
PROJECT: Trait ☐ Sean ☐ Drone ☐	
EXPERIMENT:	
PLOT_ID:	
INDIVIDUAL_NR:	
PLANT_HEIGHT (cm):	
BULK - NR_LEAVES:	LENGTH (cm):
WET_MASS (g):	
LEAF_SCANNED: ☐	
LEAF_THICKNESS (mm): 1 2 3	
DRYMASS (g):	
DATA ENTERED: ☐	



PROBLEM..



SOLUTION!



SCALING IT UP!

Challenge # 2: Make the data available



Mountain Forum 2015

Mountain Surface Processes and Environmental Changes

Chengdu/Mt. Gongga, China, 17-29 August 2015

PROBLEM..

PFTC3_2018 & Puna_2019

Readme

This file describes the projects, project teams, rules for data usage and sharing among partners and storage, experimental design, data, datasets, and anything else you might or might not want to know about PFTC3 Peru and the Puna project that followed on from these courses in 2019. We hope it will be useful. Who knows, you might even... enjoy...

This data documentation covers the PFTC3 course in 2018, and the additional activity in 2019. Both PFTC3 and PFTC5 have course specific information that should be separated for now (and merged when PFTC5 is finished).

Data dictionaries

	A	B	C	D	E	F
1	Variable name	Description	Variable type	Variable range or levels	Units	How measure
2	Project	Project from where data was collected; ITEX = ITEX warming experiment, Gradient = elevational gradients	categorical	ITEX - ITEX		recorded
3	Year	Year of sampling	numeric	2018 - 2018	yyyy	recorded
4	Date	Date of sampling	date	2018-07-19 - 2018-07-25	yyyy-mm-dd	recorded
5	Site	Site as the habitat; DH = Dryas heath, CH = Cassiope heath and SB = snowbed	categorical	CH - SB		defined
6		Warming treatment; CTL = ambient conditions, OTC = warmed by Open top chamber				

SOLUTION!

SCIENTIFIC DATA

OPEN

DATA DESCRIPTOR

Plant traits and vegetation data from climate warming experiments along an 1100 m elevation gradient in Gongga Mountains, China

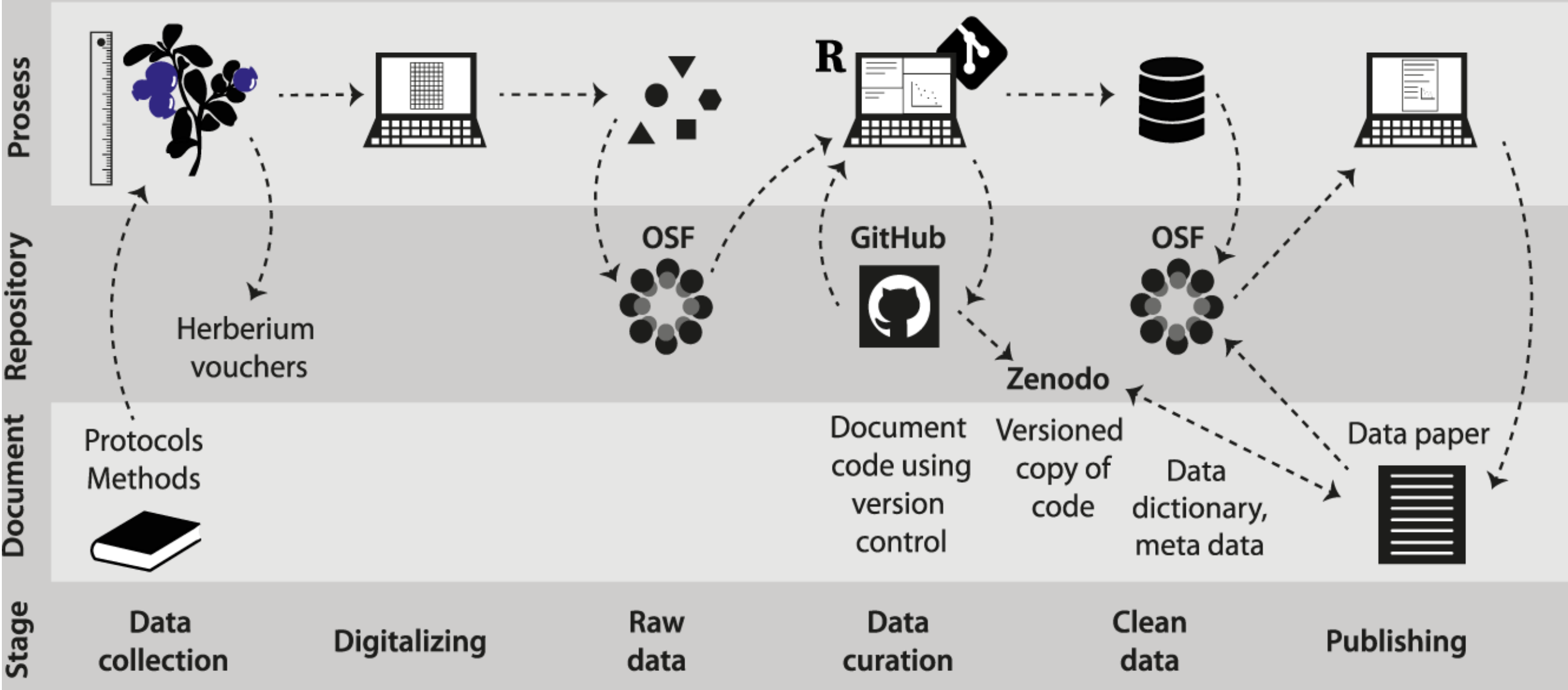
Vigdis Vandvik^{1,2}, Aud H. Halbritter^{1,2}, Yan Yang³, Hai He⁴, Li Zhang⁵, Alexander B. Brummer⁵, Kari Klenderud⁶, Brian S. Maitner⁷, Sean T. Michaletz⁸, Xiangyang Sun¹, Richard J. Telford⁹, Genxu Wang¹, Inge H. J. Althuizen^{1,2}, Jonathan J. Henn⁹, William Fernando Erazo Garcia¹, Ragnhild Gya^{1,2}, Francesca Jaroszynska^{1,2}, Blake L. Joyce¹⁰, Rebecca Lehman¹¹, Michelangelo Sergio Moerland^{12,13}, Elisabeth Nesheim-Hauge¹⁴, Linda Hovde Nordås¹, Ahui Peng¹⁵, Claire Ponsac¹⁶, Lorah Seltzer¹⁷, Christien Steyn¹⁸, Megan K. Sullivan¹⁹, Jesslyn Tjendra²⁰, Yao Xiao²¹, Xiaoxiang Zhao²² & Brian J. Enquist^{7,23}

Functional trait data enhance climate change research by linking climate change, biodiversity response, and ecosystem functioning, and by enabling comparison between systems sharing few taxa. Across four sites along a 3000–4130 m a.s.l. gradient spanning 5.3 °C in growing season temperature in Mt. Gongga, Sichuan, China, we collected plant functional trait and vegetation data from control plots, open top

Reviewer 2:
“This dataset is incredibly well-detailed, a complete credit to the authors.”

SCALING IT UP!

Reproducible data workflow



Challenge # 3: Getting it all done....

**PRE-
COURSE**

**2-WEEK
FIELD
COURSE**

**POST-
COURSE**

**Theory
Plan**

PFTC 3, 4, 5
Collect
Document
Clean
Analyze
Present..

Write
Publish

Theory
Plan
Document
Write

PFTC 6, 7
Collect
Clean
Analyze
Present..

Polish...
Publish

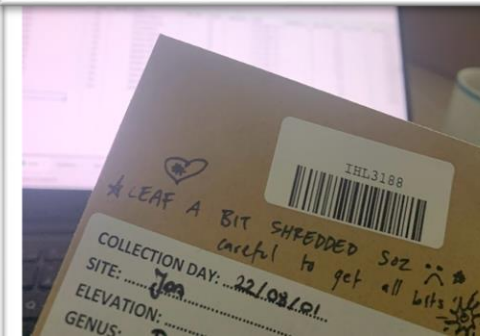
PFTC 1, 2
Theory
Plan
Collect
Analyze
Present..

Clean...
Document
Write
Publish

PROBLEM..

SOLUTION!

SCALING IT UP!



Opportunity # 2: Build a community

PFTC5 Plant Functional Traits Course, Peru, 2020 Data Sharing, Usage and Authorship Agreement

This Data Sharing Agreement regulates data management, availability, usage and ownership of (i) data collected during the PFTC5, and (ii) other data that will be used during the course. Note that the PFTC5 builds on and adds to datasets collected by the PFTC3 and Puna project, with additional data right holders and associated agreements.

The PFTC5 is part of the TraitTrain project (www.uib.no/en/rg/EECRG/78461/transplant-traittrain) funded by the Norwegian Research Council programme INTPART that aims to link international research and educational collaboration.

Received: 24 July 2020 | Accepted: 16 October 2020
DOI: 10.1002/ece3.7026

ACADEMIC PRACTICE IN ECOLOGY AND EVOLUTION

Ecology and Evolution
WILEY

From a crisis to an opportunity: Eight insights for doing science in the COVID-19 era and beyond

Julia Chacón-Labela¹  | Mickey Boakye²  | Brian J. Enquist^{1,3}  |
William Farfan-Rios^{4,5}  | Ragnhild Gya^{6,7}  | Aud H. Halbritter^{6,7}  |
Sara L. Middleton⁸  | Jonathan von Oppen^{9,10}  | Samuel Pastor-Ploskonka¹¹  |
Tanya Strydom¹²  | Vigdis Vandvik^{6,7}  | Sonya R. Geange^{6,7} 

plantfunctionaltraitscourses.w.uib.no/alumni/alumnus-network/

Home About PFTC ▾ Course organization ▾ Publications ▾ Resources ▾ Alumni ▾ Contact

Alumnus network

- Course material and protocols
- Manuscript overview
- Manuscripts in progress
- Video tutorials
- Blog

Protected: Alumnus network

Select Course:

All ▾

Protected: Manuscript overview

Proposed Manuscripts

Manuscripts in the Pipeline

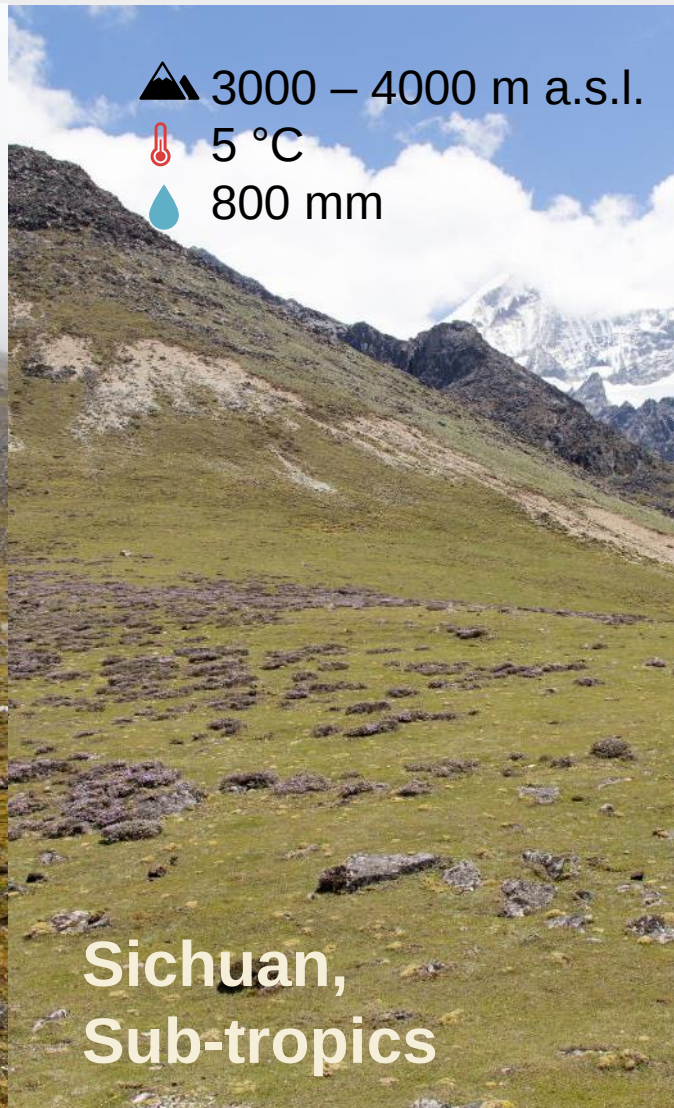
Title	Lead Author(s)	Status	Notes
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Status tags

Developing

Wayqecha, Peru, 2020

Opportunity # 3: Integrate across courses, and with local research on site



frontiers
in Plant Science

ORIGINAL RESEARCH
published: 13 November 2018
doi: 10.3389/fpls.2018.01548



Intraspecific Trait Variation and Phenotypic Plasticity Mediate Alpine Plant Species Response to Climate Change

Jonathan J. Henn^{1*}, Vanessa Buzzard², Brian J. Enquist³, Aud H. Halbritter^{3,4}, Kari Klanderud⁵, Brian S. Maltner⁶, Sean T. Michaletz^{6,7}, Christine Pötsch⁸, Lorah Seltzer⁹, Richard J. Telford^{3,4}, Yan Yang³, Li Zhang³ and Vigdis Vandvik^{3,4}

Received: 2 March 2022 | Revised: 3 August 2022 | Accepted: 22 August 2022
DOI: 10.1002/ecom.1555

ARTICLE

ECOLOGICAL
MONOGRAPHS
VOLUME 92 NUMBER 1
JANUARY 2022

Intraspecific trait variability is a key feature underlying high Arctic plant community resistance to climate warming

Ingibjörg S. Jónsdóttir^{1,2} | Aud H. Halbritter³ | Casper T. Christiansen^{4,5,6} | Inge H. J. Althuisen⁴ | Siri V. Haugum³ | Jonathan J. Henn^{7,8} | Katrin Björnsdóttir⁹ | Brian Salvin Maltner¹⁰ | Yadvinder Malhi¹¹ | Sean T. Michaletz¹² | Ruben E. Roos¹³ | Kari Klanderud¹³ | Hanna Lee^{3,14} | Brian J. Enquist¹⁵ | Vigdis Vandvik^{3,4}

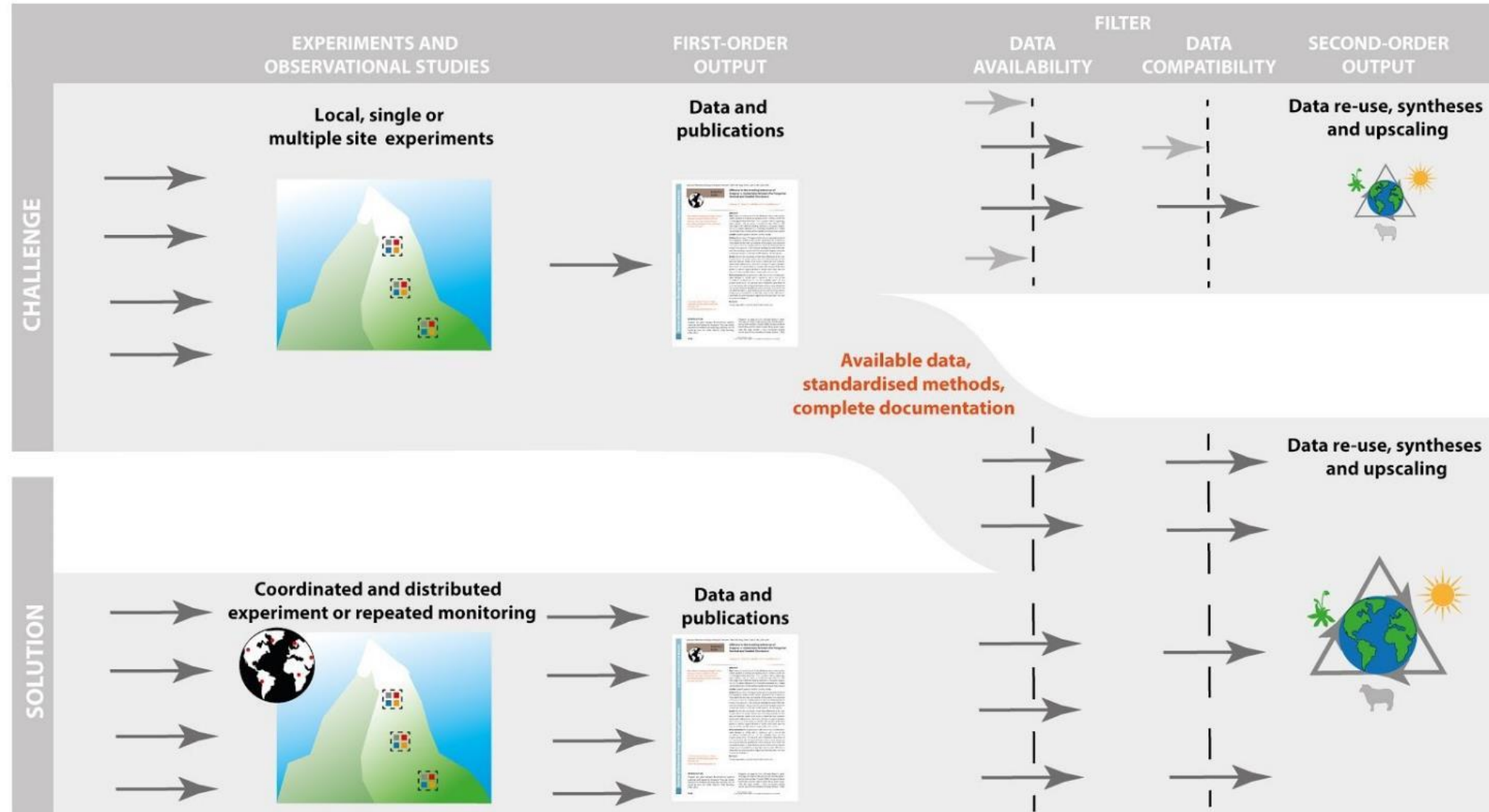
The handbook for standardised field and laboratory measurements in terrestrial climate-change experiments and observational studies (ClimEx)

Aud H. Halbritter , Hans J De Boeck, Amy E. Eycott, Bernd Berauer, Casper T. Christiansen, Marc Estiart, Anke Jentsch, Hanna Lee, Sune Linder, John Marsh, Stuart-Haëntjens, Peter Wilfahrt, The ClimMani wor... [See fewer authors](#) ^

First published: 05 November 2019 | <https://doi.org/10.1111/2041-210X.13444>

[Go here for SFX](#)

> 500 page of detailed methods descriptions to help ensure data, approaches are as standardized and comparable as they can be (but no more)...



Opportunity # 4: Showcase all the cool stuff that we can do with traits!



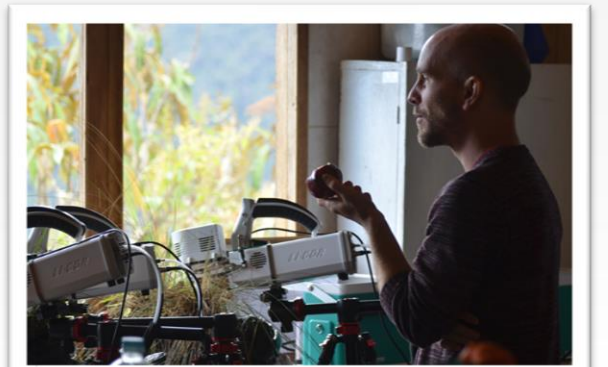
Community ecology



Ecosystem functioning

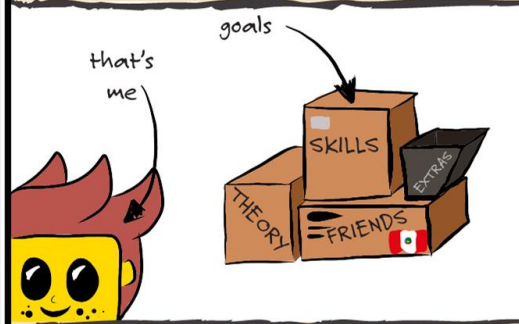


Landscape processes



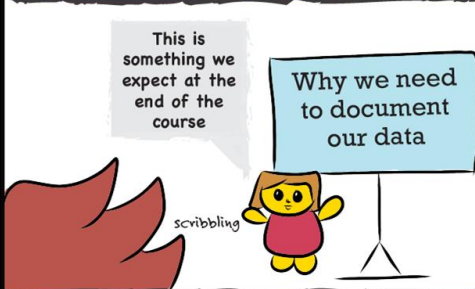
Plant physiology

MY EXPECTATIONS FOR PFTC WERE SIMPLE...



...BUT IN REALITY I ENDED UP BRINGING HOME A LOT MORE

1. THEORY - AND THEN SOME



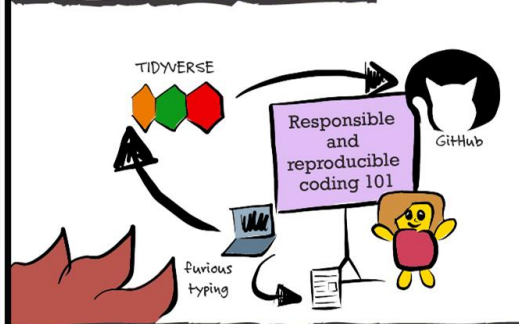
ALONG WITH THEORY WE WERE TAUGHT BEST PRACTICES IN REPRODUCIBILITY AND DATA DOCUMENTATION

2. ECOLOGICAL SKILLS



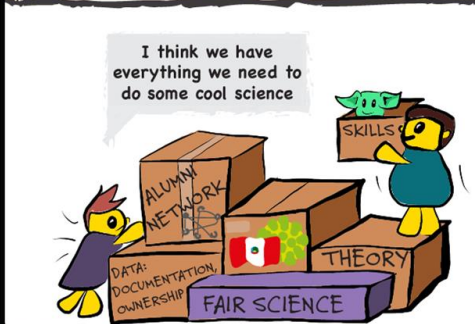
THE TRAITSWHEEL™ ENSURED STANDARDISED DATA COLLECTION, CURATION AND DOCUMENTATION

3. NEW WORKFLOWS



WE LEARNT ABOUT REPRODUCIBLE WORKFLOWS (AND BEST PRACTICE) BY DOING

4. MAKE FRIENDS; DO SCIENCE



THE COLLEGIAL PHILOSOPHY EMPHASISED THAT SCIENCE IS A COMMUNITY EFFORT

LEARN ABOUT OPEN SCIENCE SPACES



HAVING SOMEONE HOLD YOUR HAND WHEN VENTURING INTO THE 'SCARY' WORLD OF OPEN SCIENCE HELPS

The PFTCourses in brief....

SYSTEMATIC DATA CURATION AND DOCUMENTATION

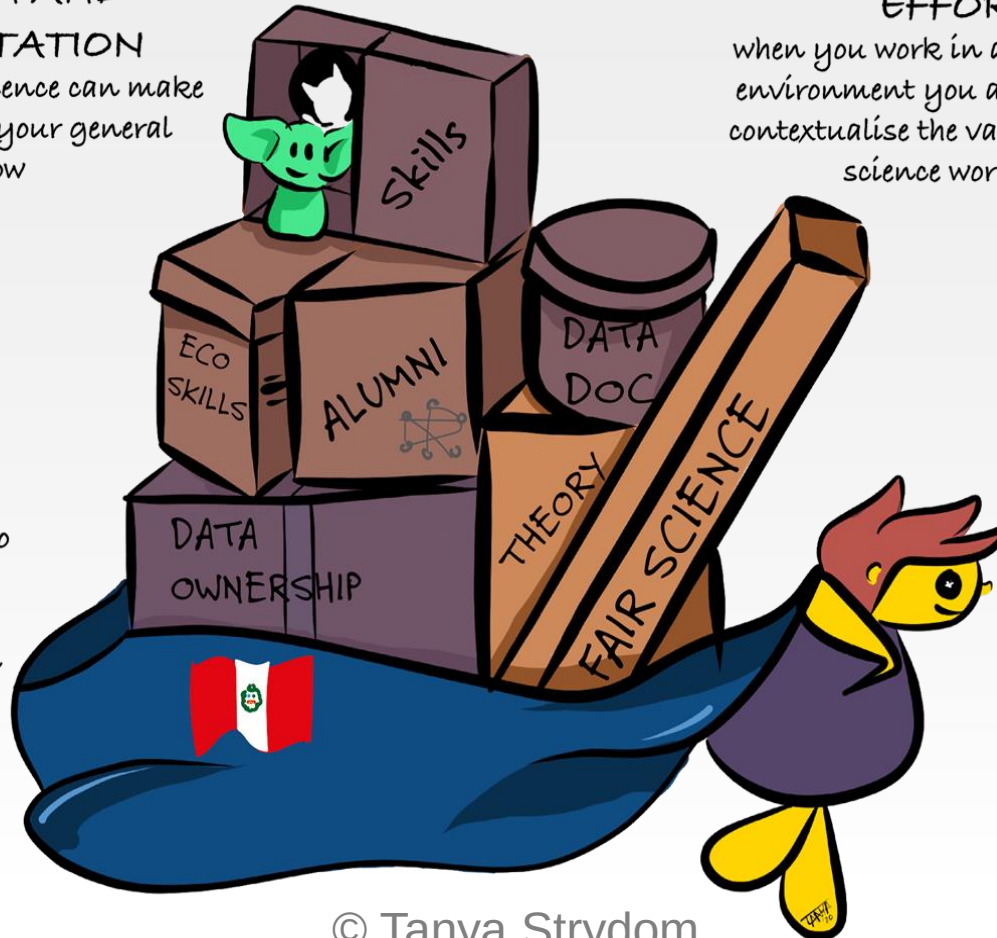
'seeing' how open science can make
up a large part of your general
workflow

SCIENCE IS A COMMUNITY EFFORT

when you work in a collaborative
environment you appreciate and
contextualise the value of an open
science workflow

LEARNING BY DOING

having someone there to
hold your hand and
introduce you to
'bite-sized' bits of open
science



© Tanya Strydom

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DOI: 10.1002/ece3.7009

ACADEMIC PRACTICE IN ECOLOGY AND EVOLUTION

Ecology and Evolution
WILEY

Next-generation field courses: Integrating Open Science and online learning

Sonya R. Geange^{1,2} | Jonathan von Oppen^{3,4} | Tanya Strydom⁵ |
Mickey Boakye⁶ | Tasha-Leigh J. Gauthier⁷ | Ragnhild Gya^{1,2} |
Aud H. Halbritter^{1,2} | Laura H. Jessup^{8,9} | Sara L. Middleton¹⁰ |
Jocelyn Navarro¹¹ | Maria Elisa Pierfederici¹² | Julia Chacón-Labela¹¹ |
Sehoya Cotner^{1,13} | William Farfan-Rios^{14,15} | Brian S. Maitner¹¹ |
Sean T. Michaletz¹⁶ | Richard J. Telford^{1,2} | Brian J. Enquist¹¹ | Vigdis Vandvik^{1,2}

Thankyou!

Adam Ccahuana, Adam Chmurzynski, Agustina Barros, Ahui Peng, Alexander Byers Brummer, Alexander Elsy, Alexander Sæle Vågenes, Alyssa N. Olson, Alyssa Smith, Alyssa T. Kullberg, Anders Isaksen, Andrea Palomino Cardenas, Andrea Sánchez-Tapia, Bárbara Javiera Seaman Espinosa, Barbara M. Neto-Bradley, Barryette Oberholzer, Bernard Olivier, Blake Lee Joyce, Casper Christiansen, Celesté Maré, Christien Steyn, Christine Pötsch, Claire Ponsac, Cora Ena Löwenstein, Coskun Guclu, Courtenay Ray, Dagmar Egelkraut, Dickson Mauki, Eleanor Thomson, Elisabeth Nesheim Hauge, Emil Alexander Sherman Andersen, Erickson Giomar Urquiaga Flores, Erik Kusch, Eugenia Sanchez Diaz, Eva Lieungh Eriksen, Fei Ran, Fernanda Chiappero, Fiorella Gonzales, Francesca Jaroszynska, Frida Knoop, Hanna Lee, Hilary Rose Dawson, Hilde Rui, Iláine Silveira Matos, Imma Oliveras, Inge Althuizen, Jess Rickenback, Jesslyn Tjendra, Jhon del Aguila Pasquel, Jhonatan Sallo Bravo, Jocelyn Navarro, Jocelyn Navarro, Joe Atkinson, Jonathan A. Wang, Jonathan Henn, Jonathan von Oppen, Josef Garen, Joseph Gauard, Joshua André Erkelenz, Julia Chacon, Julia Eckberg, Julia Kemppinen, Kai Lepley, Kai Lepley, Kari Klanderud, Karolína Pánková, Katrín Björnsdóttir, Kine Blom, Korina Ocampo-Zuleta, Kristine Birkeli, Kristýna Kuncová, Laura Jessup, Leonardo Hamachi, Li Zhang, Linda Hovde Nordås, Linn Vassvik, Lohengrin Cavieres, Lorah Patterson, Lorelei Patrick, Lucely Lucero Vilca Bustamante, Mackenzie Lift, Marc Macias-Fauria, Marcus Spiegel, Maria Elisa Pierfederici, Marta Baumane, Marta Raquel Cardoso Lopes Correia, Mary Linabury, Matiss Castorena Salaks, Megan Kathleen Sullivan, Meghan T Hayden, Michelangelo Sergio Moerland, Mickey Boakye, Miguel Muñoz Mazon, Molly Ng, Mukhlis Jamal Musa Holle, Natalia L Quinteros Casaverde, Nicole Bison, Nina Roth, Paul Efren Santos Andrade, Pekka Niittynen, Pernille Bronken Eidesen, Pia Bradler, Polly Bass, Ragnhild Gya, Rebecca Lehman, Rebekka Gullvåg, Ruben Roos, Rudi Cruz, Sam J. Ahler, Samuel Pastor Ploskonka, Sandra Duran, Sara Middleton, Sehoya Cotner, Shuli Chen, Signe Maskell Knudsen, Silje Östman, Siri Vatsø Haugum, Sonya Geange, Sorrel Hartford, Susan Eshelman, Tanya Strydom, Tasha-Leigh J. Gauthier, Tom Vorstenbosch, Trace Martyn, Vanessa Buzzard, Verónica Noemí Zepeda Martínez, Verónica Pinelli, Will Johnson, William Farfan-Rios, William Garcia, Xiangyang Sun, iaoxiang Zhao, Yadvinder Mahli, Yan Yang, Yao Xiao, Yaoqi Li.



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