RITUALS TO REMEMBER
Do rituals help or hinder recall?

MOVING FORWARDS
Cumulative culture in real-life programming data

AGONY AUNT
Making the most of your first conference

THE HIVE-MIND AND YOU
Has science-fiction got it all wrong?

Cultured Scene

THE MAGAZINE OF THE ASSOCIATION OF YOUNG SOCIAL LEARNING RESEARCHERS /// YSLR.CO.UK

CULTURAL TRAITS

What is the role of social learning in acquiring food cleaning behaviour?

YSLR

No. 2, March 2018

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Applications close March 31st

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Association of Young Social Learning Researchers

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2nd edition of Cultured Scene, published three times a year

Cultured Scene is produced by

YSLR – Young Social Learning Researchers

www.yslr.co.uk

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Cover image: Gorilla watching by Pixel-mixer, Canva stock photo.

Welcome

Ready, Steady, Spring

Photo by Meric Dagli

The snow is slowly melting, the sun is shining longer, and nature is returning from hibernation. The signs are clear: only three months to our second annual workshop. This year, we are going to meet at the University of St. Andrews, Scotland, where an exciting program awaits you (page 6). But let us start at the beginning, the reason why you can read these lines is because we gave Cultured Scene new life with this second issue. We have a lot of ideas for content for many issues to come (page 5). We plan to publish Cultured Scene three times a year; and with your help this can become a reality. While we will use this space to update you on the latest news of the society, such as the upcoming name change (page 7), we especially proud about exciting articles from our members Damien Neadle, Elena Miu, and Rohan Kapitány on their recent projects (pp. 11, 14, and 25). We also got an interview with Sylvain Alem and behind the paper insights into his bumblebee string pulling experiment. The feature article by Stephen Heap discuses the hive-mind and its pop-cultural references (page 19).

Also, if you are about to go to your first conference, fear not, our Agony Aunt article gives recommendations on how to make the most of it (page 15).

Let me close this welcome message by saying, the journey a researcher is taking is most enjoyable with good company. I have already found great people and friends in this slowly growing society, and I hope you will do too. By respectful sharing of our individual stories, ideas, and visions, independent of our personal and professional background we can make our work to go beyond interesting. Let's make it exciting. For everyone! □

Marco Smolla is currently a postdoc at the University of Pennsylvania, Philadelphia, where he studies the effect of cultural complexity on population structure.

YSLR Chair

Cultured Scene Our All New Magazine

May I introduce the latest issue of our Society's magazine. What is it for and what kind of articles and topics can you expect in this and the upcoming issues?

Early on in your career you have one hundred and one questions. What does it mean being a scientist? How do others handle obstacles? Where are the resources that can help you with your research? And what exactly is happening in your field? Cultured Scene wants to support, inform, and of course entertain you throughout your career as a scientist. It is not only one of the Society's communication channels, but also a place to connect ideas across various disciplines, and a way to test your own writing skills. For that, we want to hear your stories. How did you get through the roller-coaster called PhD? How did you deal with problems with your supervisor? And why are you still in academia? You would be surprised how interesting and different replies to these question can be, and how helpful it can be to read them. But we also want to hear your research stories. What are you working on? How did you come up with the idea for the project, and how is it helping to understand broader questions in cultural evolution?

Looking back: the first issue of Cultured Scene in 2016

Here are a few regular features you can expect in our upcoming issues:

From Pitch to Publication

An interview with the author of a recent publication or pre-print in the field. How did they come up with the question, how did they collect the data or conduct the analysis, what challenges did they encounter? In other words, what is the story behind the data?

Analyse That! – My Analysis Brings All the Researchers to the Yard

You discovered a fancy new tool to analyse your data, or use a method that is common in another field but novel to yours? Share it here and get the word out.

Culture Goes Pop

Everything is culture?! Let us go one meta-level up and we have a culture of talking about culture, be it books, journals, movies, tv-shows, or podcasts. Here we want increase the meta-level and discuss how pop culture portrays different aspects of culture.

Agony Aunt – We've Got 99 Problems

Answering your problems. Using social media polls on twitter and facebook, but also contacting people at different career stages we aim to find solutions to the questions you have. In this issue, for example, we discuss how you can make the most of your first academic conference.

Meet Our Members

Where are our members? What are their institutions like? In this section we want to uncover the actual places where the academic work is happening to get a better understanding of the diversity of our society.

We have many ideas for content, but crucially we rely on your input. Your stories will make this journal and your society come to life. If you have ideas for an article or a new section, however crazy it might be, get in touch with us. We cannot wait to hear from you □

Summer Workshop 2018

21st-22nd June 2018
University of St Andrews (UK)

It is time for our Society's second annual workshop. Following a successful first edition, held in Manchester in 2017, we invite you now to a two-day multidisciplinary workshop at the University of St Andrews, UK.

This year's workshop aims to reflect on the current state of the field and on how it is changing. We will discuss methods and recent research that are likely to drive trends in the next few years – an important perspective to consider, as an early-career researcher. As before, the workshop will be multidisciplinary, merging ideas from different fields. Part of the event will also be dedicated to exchanging experiences on issues in early-career research. Check out the schedule below.

Participants are invited to present a poster with their research work. We are excited to announce that there will be a poster competition, with the best poster – in terms of research quality, novelty of the work and, last but not least, presentation - selected by a jury of two experts in the field, one of which is going to be Prof Andy Whiten.

The event will conclude with a panel of senior researchers discussing their experience in the field of social learning and cultural evolution and how they have seen it changing: Learnt Perspectives: 20 years of Social Learning. Confirmed panel guests so far are Prof Malinda Carpenter, Prof Andrew Whiten, Dr Luke Rendell, Dr Monica Tamariz and (TBC) Dr Ellen Garland.

Applications from researchers and students from Masters to Postdoctoral level are invited. Applicants will need to state their interest, describing their area of research and how they think attending the workshop will benefit them.

The maximum number of attendees is limited to 50 and applicants will be selected on the basis of the statement and, when equal, on a first-come-first-served basis.

Applications close on March 31st 2018. Registration, upon acceptance to the workshop, is £10. As the membership fee is currently also set at £10 all attendees are free to become dues-paying members, for no extra cost in the first year. □

	Thursday 21st June		Friday 22nd June
9:00 – 9:30	Registration Coffee	9:00-10:00	Keynote 2: Alexis Breen
9:30 – 9:45	Opening remarks	10:00 – 11:00	Activity 4: Issues in early-career research
9:45 – 10:45	Keynote 1: Dr Eoin O'Sullivan	11:00 – 11:30	Coffee break Poster session
10:45 – 12:15	Activity 1: Social Learning across disciplines: state of the field	11:30 – 12:30	Activity 5: Working cross-disciplinarily: group-based project proposal
12:15 – 13:15	Lunch Poster session	12:30 – 13:30	Lunch Poster session
13:15 – 14:30	Activity 2: Future directions	13:30 – 15:00	Activity 6: Science communication: Explaining Social Learning on Wikipedia
14:30 – 15:00	Coffee break Poster session	15:00 – 15:30	Coffee break
15:00 – 16:30	Activity 3: Studying Social Learning: techniques and methods	15:30 – 16:45	Senior researchers panel: Learnt Perspectives – 20 Years of Social Learning
16:30 – 18:00	Open poster session Wine reception	16:45 – 17:00	Closing remarks

Early-career but not young? On the society's upcoming name change

In case you have not already heard it, our society will soon receive a new name. In a couple of months we say goodbye to YSLR and embrace our new name, The Early-Career Social Learning Researchers, or ESLR.

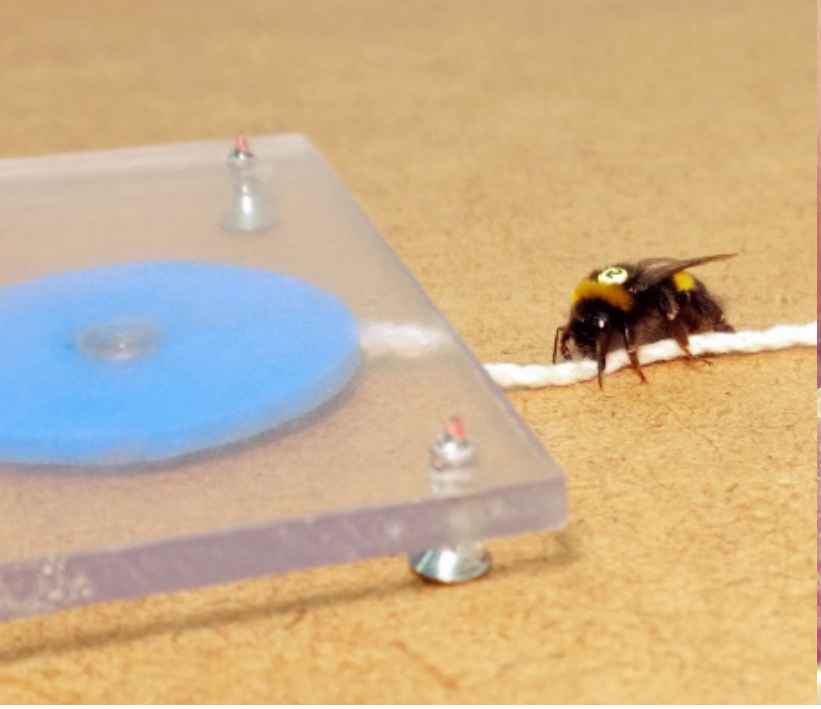
Over the past weeks and months, our committee has been working on turning our semi-regular meetings in 2016 and 2017 into a more formally organised society. We drafted a constitution, developed our vision for the society, made decisions on our code of conduct, kicked-off plans for our society journal Cultured Scene, and finally started with the preparations for our upcoming workshop in June. One of the many topics was the society name, and whether we should keep 'young' in the name. At the time it appeared reasonable to stick with it, as we found it frequently in the names of awards, grants, workshops, and conferences that aimed at early-career researchers. Another reason to keep it was that we already started advertising our workshop under the YSLR name, and those four letters slowly started to be recognised by people in social media. Anti-discrimination is a core value of our society and therefore also an integral part of our constitution, which states:

§3 d. […] The Society is committed to the philosophy of equal opportunity and respectful treatment for all regardless of national or ethnic origin, religion or religious belief, gender, gender identity or expression, race, colour, age, marital status, sexual orientation, disabilities, or any other reason not related to scientific merit. […]

We assumed this would be sufficient to express that we do not mean to discriminate, or for that matter accept any acts of discrimination, against early-career researchers, who might not describe themselves as young. However, the discussions we since had with you, our members, made us reconsider. We toyed around with many different ideas and finally agreed on The Association of Early-Career Social Learning Researchers. It combines our focus on scientists that just started their careers, or are close to have their own lab, as well as our research field social learning and cultural evolution.

We are currently in the process of organising the name changer. This includes changes to our website, URL, mailing list and email addresses. We will also have to change our names and pages on social media such as twitter and facebook. Furthermore, as mentioned above, we already started to advertise the workshop under the name YSLR. Therefore, the new name will be live right after our Summer Workshop in June.

Let me close with this: we did not mean to be excluding or discriminating. We are all early-career and we are all bound to make mistakes. What is important is to keep talking and learn from those mistakes. We hope that you approve of our roadmap and the planned changes. Keep in touch and send us your feedback and critique via mail, twitter, or on facebook. □



Pulling Strings and the State of Bumblebee Culture

Sylvain Alem and his colleagues trained bumblebees to manipulate a feeder by pulling small strings.[1] Observer bees quickly picked up this behaviour and soon performed it themselves. Here, we talk about the "absurdity" of this observation and what it can tell us about cultural evolution.

Cultured Scene: Lars Chittka, the senior author on your paper said: 'What I like about the work, in addition to the experimental and intellectual challenges and insights, is the sheer absurdity of seeing bees solving a string-pulling puzzle.' What did you think the first time a bee successfully pulled the string?

Sylvain Alem: Really, I did not think anything. I just jumped. It was fortunate that the video was not recording the sound at this moment. We had a lot of swearing at the time. We spent months to train the bees and suddenly it was right in front of us. I just couldn't believe it. We did not think of any of the far-reaching consequences. It was just sheer happiness and exaltation. As Lars said, it was absurd to see this little, clumsy insect pull a string and solve a task that is usually solved by big brained animals.

CS: How did you conceive the study? You invested quite so much time in training the bees. Did you always have the string-pulling experiment in mind?

SA: No, no, no. There is a saying in France: Let's give back to Cesar what belongs to Cesar. It was originally an idea from Lars. One day he called me in his office and said: "You always need a risky project in your career and I had this in mind for a while. So, if you are happy to try it, this could be your risky project." Of course, I immediately liked the idea. The sheer absurdity.

Initially, we tried a vertical setup, with a vertical arrangement of flowers and a little plug on top attached to a string that the bees could pull to get a reward. But it didn't work at all, because, usually the bees preferred to push rather than to pull the little plug. It took a few weeks to review the literature on what had been done on string pulling. I chatted with Clint [Perry], as he was working on a similar problem-solving task with rats. In the end, it took the three of use, Lars, Clint and me, to design the final setup with the transparent tables. This is not what we thought of at the beginning. Our

In their experiments, Sylvain Allem and his colleagues found that bumblebees learned to pull strings to reach an artifical flower and its sugarry reward (left and right). The bees are often eager to participate but here they have to wait for their turn (centre).

first ideas were really far from what is currently the protocol.

CS: String pulling experiments are commonly used as cognitive tasks, to test for an abstract understanding of a physical problem. They have been used before with birds and apes. How do your experiments with bumblebees compare to the ones in vertebrates?

SA: Most of the experiments in other animals actually show that they don't have an abstract understanding. I think in ravens they have shown that the birds can spontaneously solve the task. Here we don't show this at all. We don't say the bees understand the task. On the contrary, we say that with very simple associative mechanisms, like Pavlovian associative learning, they can learn to solve a task that looks quite complicated that we thought only big brains can solve that have an ability for abstraction. But we do not claim that this is the case in bees.

CS: Science titled their report on your work with 'Hints of tool use'. There is a controversy whether your experiment actually shows tool use, given that the strings are attached to the actual object, whereas tools are usually not.

SA: My opinion on this I quite clear. Because when – Science asked whether there are hints of tool use in this paper, we answered: No. No, there is not. Don't publish anything like this. In the end, they did it anyway.

In our case, the string is part of the flower to which it is attached. This is different from, for example, chimpanzees that might find a stick or a stone in the environment, carry it around and use it. But here, this is clearly not the case.[2]

CS: Some individuals were good in innovating, and apparently many are good in observational learning. What do you think differentiates the 'smarts' from other individuals in the colony?

SA: That is a really good question and to be honest we actually don't know. But it would make a perfect PhD project. What makes these individuals different from others? It might be that they have different experiences in the hive, having more interactions with others. It could be genetic. Maybe a difference in learning ability based on synaptic connectivity. But it could be also a difference in motivation. Or the amount of time they pay attention to other bees. But we still don't know what the neuronal substrate for motivation in bees actually is.

We noticed variation across and between colonies. If a bee had a lot of experience with a demonstrator it doesn't mean that this very bee learned the task. Some learned the task after two instances, while others could still not do it after ten or fifteen instances. It is a bit like in humans (laughs).

CS: The reproductive unit in bumblebees is

the queen bee, yet you report social learning at the worker level. How could a novel behaviour improve over time, or get transmitted to the next generation?

SA: This is a problem of the model organism we are using here. Bumblebees are seasonal and I cannot see a mechanism for learned behaviours to be passed on from one generation to another. Only if a queen learned it before hibernation and then also successfully remembers this in the next season, there would be a possibility. But this seems quite unlikely.

However, what we show is less about cultural evolution but more about the fundamental mechanisms and the potential. A potential that is present in small-brained insects.

CS: Alex Wild, Curator of Entomology at the University of Texas, tweeted in response to your article: "Biologists taught bees to pull strings and started a cultural revolution. In the bees' own cultures." He is referring to the cultural processes within the colony. What does your experiment teach us about cultural evolution? Do you think that your insights will change how we think about culture?

SA: I hope so, yes. It sheds light on the mechanisms involved in cultural evolution. The fact that it is not necessary to have highly sophisticated behaviours like teaching and imitation to evolve a culture. Instead simple mechanism like stimulus enhancement are already very effective.

We don't need very sophisticated social information transfer to gain culture-like phenomena. For some reason, our species started to modify the environment, which made it possible for more sophisticated mechanisms to evolve. If we can't see aspects of culture in bumblebees or other social insects in nature it is not because they don't have the capacity. It is just because they missed the opportunity to evolve these aspects.

CS: Christian Rutz, an evolutionary ecologist who studies bird cognition at the University of St. Andrews said: The study "successfully challenges the notion that 'big brains' are necessary" for new skills to spread. Do you agree?

SA: For a long time, it was assumed that the capacity for culture is uniquely human, and that explains why there is only one species that achieved this level of culture. But our study tells us that this might not be the case actually, because even insects have the capability. I guess it is a good lesson of humility. □

Sylvain Alem was, at the time of the interview, a post-doc at the Lars Chittka bumblebee lab at Queen Mary University in London. He is now working as a policy adviser at the Government Office for Science.

REFERENCES

1) The paper is open-access and available at PLoS Biology: Alem S, Perry CJ, Zhu X, Loukola OJ, Ingraham T, Søvik E, Chittka L. 2016 Associative mechanisms allow for social learning and cultural transmission of string pulling in an insect. PLoS Biology 14, e1002564–e1002564. (doi:10.1371/journal.pbio.1002564)

2) A more recent study aimed to identify tool-use in bumblebees: Loukola OJ, Perry CJ, Coscos L, Chittka L. 2017 Bumblebees show cognitive flexibility by improving on an observed complex behavior. Science 355, 833–836. (doi:10.1126/science.aag2360)

Is string pulling relevant for bumblebees? Maybe not strings, but bumblebees often manipulate large flowers to reach its nectar.

Photo by George Hiles

Clean Eating Gorillas Get There On Their Own

Damien Neadle spoke to Cultured Scene about his recent publication and its making: Social learning is a possibility but not a necessity.

The paper

Cultured Scene: What is the key finding of your study?

Damien Neadle: The key finding is simple, gorillas can display food cleaning (a behaviour recently suggested to be a putative cultural trait) without an absolute need for social learning. That is, individual learning is sufficient to explain the emergence of this behavioural form – but this does not discount the fact that social learning may facilitate its expression within a community. Frequency and form of a behaviour are two very different aspects to explain.

CS: Why is this topic important, and how do you feel it relates to social learning and cultural evolution more broadly?

DN: The fact that some behaviours have been shown to be reinnovated (i.e. made possible by individual learning alone) adds to the hypothesis that social learning may not be necessary in the expression of other potential cases of culture in non-human animals.

The process

CS: How did you arrive at the idea for the study?

DN: I noticed, upon reading the target paper on wild gorilla cultural behaviours, that one purported case of cultural behaviour in particular (food cleaning) seemed similar to food washing, a behaviour that my supervisor (Claudio Tennie, and colleagues) had previously investigated. I asked Claudio whether he still had the data, and he then directed me to his collaborator (Matthias Allritz) who located the old videos. I then reanalysed these videos with a new objective, namely to look for the food cleaning behaviour as identified by the field researchers. And indeed, we found it, i.e. in a culturally unconnected (captive) population. This project was the first of my PhD.

CS: What was the most challenging aspect of conducting the study?

DN: To be honest, the whole process went very smoothly. Having said that, it was a lot of work coding the videos and the writing process was a learning curve.

CS: What were the best and worst aspects of data collection – any funny stories?

DN: I used to send my supervisor every email before it was sent to Matthias, I was worried that I might accidentally offend him or overstep some hidden mark. One day my supervisor said to me, there is no need to send me these emails… you are British, Matthias is German, you will not offend him!

Publishing

CS: How did you manage the writing process? Was it straight forward, or were there challenges?

DN: The writing process was enjoyable. We all worked very well together and our writing styles meshed very well. This said, the writing process demanded that the manuscript went through many versions and formatting changes. This is very normal and a part of the publication process as it stands.

CS: How was the peer review process?

DN: The peer review process was probably the part that I was most apprehensive of, I had heard horror stories about reviewers tearing papers apart. However, our editor (Katie Slocombe) and review-

ers (Lydia Hopper and an anonymous reviewer) were very good. They were firm but fair, and I think that the paper is substantially better as a result of their inputs. I can only hope that my next reviewers will be this helpful!

What's next?

CS: Will you be following up on this research? What questions interest you next, based on your findings?

DN: This research was more of a follow up of Claudio and Matthias' previous work with Josep Call and Martha Robbins' method of exclusion paper (based on field data). However, it does compliment the general approach of our lab to scrutinising putative cultural dependent traits by testing naïve subjects. Culture dependent traits are those beyond the pure individual learning capacity of a species. Thus, if naïve subjects show the behaviour, they cannot be culture dependent. But they may still be cultural, in a minimal sense. We published, in this paper, a very minimal definition of culture (a sort of "soft culture"). For this minimal culture, (any type of) social learning is the process and culture the automatic product.

CS: As early career researchers, we're always learning. Is there anything you'd do differently in future, based on your experiences conducting this study?

DN: I learned that it is always best to agree (between authors) on the basics of the story that you are telling before you even begin telling it (in our lab we do this by bullet pointing the bare bones of the paper before adding the prose once everyone agrees on the narrative). This process has shaped the way that I write and work going forward.

CS: Finally – what do you think are some of the big questions / challenges facing the field of cultural evolution and social learning?

DN: The challenges are the same as every other area of science, replicability and open research practices. I think that it is very important that researchers adopt a more open approach to the scientific process. This will allow the public to regain their trust in the scientific community and allow us to assess others' work in the cold light of day!

A big, much debated, question is: how similar are non-human animal cultures to those that we have come to take for granted in our own linage? Also, how and why they evolved in us. □

Damien Neadle is a second year PhD student at the University of Birmingham. He initially got his BSc (Hons.) from Bangor University and then moved to the University of Birmingham for his MSc. He is a psychologist by training, however, his current research interests centre around culture in non-human animals. Contact: NeadleDL@bham.ac.uk

Neadle, Allritz & Tennie (2017) Food cleaning in gorillas: Social learning is a possibility but not a necessity. PloS one, 12(12), e0188866.

Write with us

We want to hear your story. What is it like being an early-career researcher? What do enjoy, what do you struggle with?

Get in touch with our journal secretaries Rachel and Steve.

YSLR

Association of Young Social Learning Researchers

Moving Forwards by Tweaks and Bounds

Elena spoke to Cultured Scene about the first paper from her PhD, which is currently under review.

The paper

Cultured Scene: Tell us about your paper – what are the key findings?

Elena Miu: This is the first paper that came out of my PhD, which has been 4 years in the making, and it just recently came back from review (it's not published yet). My PhD was mainly concerned with cumulative cultural evolution, and in this paper we studied its dynamics using a large-scale dataset from online collaborative programming competitions organised by MATLAB. Each contest consisted of participants trying to solve computer science problems while having full access to each other's solutions. Within each contest population performance increased over time through many 'tweaks' of the current best entry and rare innovative 'leaps', which were associated with either big improvements or large failures.

We show that this process of cumulative culture reduced technological diversity over time, as individuals focused on refining high-performing solutions, and that while individual entries borrow from few sources, repeated copying drives populations to integrate ideas from many sources, showing a type of collective intelligence. This work has obvious implications for the field of cultural evolution and trying to understand the question of human uniqueness, but also speaks about collective improvement and technological progress.

The process

CS: How did this paper get made? Where did the original idea for the study come from, and were there any challenges along the way?

EM: This paper, rather unconventionally, started with a dataset. Cumulative culture is a long-term, complex process, and, understandably, much of the experimental work addressing this question used simple tasks in the lab. Our dataset, though, was a lucky find that perfectly encapsulates realistic, large-scale microcosms of cumulative culture. Much of the challenge, then, was not data collection, but trying to organise and make sense of what we were looking at. More data is a great thing, but you quickly tend to forget that when you're trying to decide which of the 10 really cool hypotheses you came up with you should test in the time you have left until your PhD stipend runs out (or when you're trying a load all that data in R!). We ended up extracting some really interesting points though, and it's been a good exercise in patience and discipline (much of that honed through learning Bayesian statistics over the internet). That being said, I've had a lot of fun getting to know my participants retrospectively through online forum discussions, and I've learned much more than I thought I would about data visualisation techniques (colour palettes are important!).

Publishing

CS: The writing and publishing process can be notoriously difficult - how did you find it?

EM: I've always thought that the writing stage, when your results are all spelled out, you've put them in perspective, and everything comes together, is my favourite step of a study. And it still is, but in our case it took a bit longer than I expected because we kept discovering neat analyses we wanted to do, and kept changing our minds about which journal would be a better fit. You learn very quickly that different journals have very different formatting requirements, but that wasn't really an

issue (remember colour palettes?). The best consequence of this long refinement process was that the reviews were not painful to read at all!

What's next?

CS: Will you be following up on this research? How will what you learnt in the process inform your future work? And what big questions do you see on the horizon for cultural evolution as a field?

EM: My current work follows closely from my PhD – I study innovation and cumulative improvement though theoretical and large-scale experimental approaches – so you'll hopefully be seeing more specific, controlled studies from me, complimenting this observational approach. This has definitely been a topsy-turvy ride, but I don't think I'd change anything about it. I might have a stack of folders full of unproductive analyses, but I've learned from all of the uncertainty, and that's what PhDs are all about.

Looking forward, I'm not going to try to predict where the field is going, but I'm very excited to read Celia Heyes' new book, 'Cognitive Gadgets: The Cultural Evolution of Thinking'. □

Elena Miu studied Linguistics and Artificial Intelligence at the University of Edinburgh, and recently finished a Biology PhD with Luke Rendell at University of St Andrews. She is currently working as a post-doc with Tom Morgan in the School of Human Evolution and Social Change at Arizona State University.

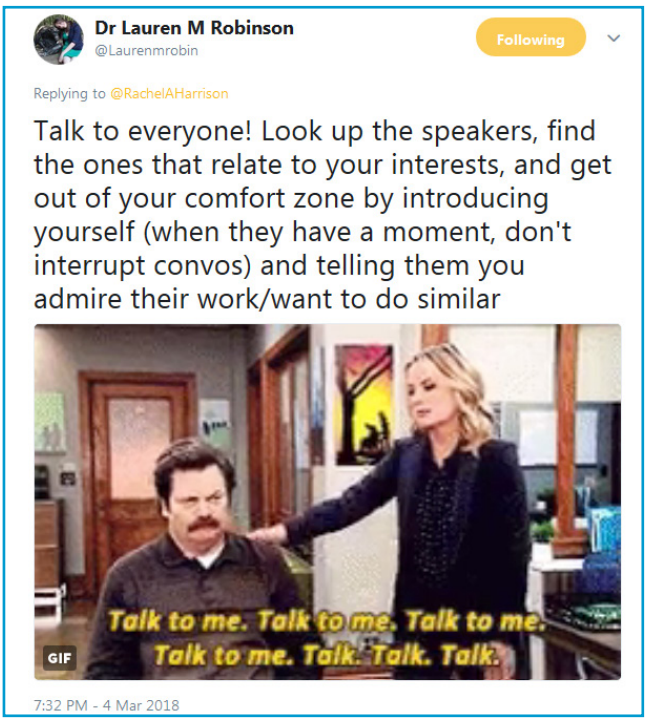
Wisdom of the Crowd

Our resident Agony Aunt offers guidance on the crucial questions bothering early-career researchers, with additional advice crowd-sourced from Twitter. In this issue:

How to make the most of your first academic conference?

Conferences! Some people love them, some hate them. They can be stressful, exhausting, and expensive. But conferences are also fantastic networking opportunities, provide a chance to present your work to the (potentially) small number of people in the world who are genuinely interested in it, and they can be a lot of fun – especially if you follow this advice!

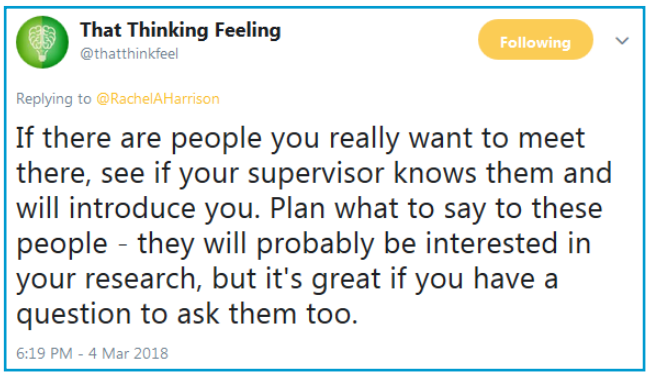
Making the most of the conference is important – after all, you may well have paid a lot of money to attend, and the conference might only come around every couple of years. My first piece of advice, though, is not to put too much pressure on yourself. It's likely that you won't make it to every talk you want to hear, or that you won't have a chance to talk to every senior academic you're



hoping to track down. And that's ok! No one manages to do everything at every conference.

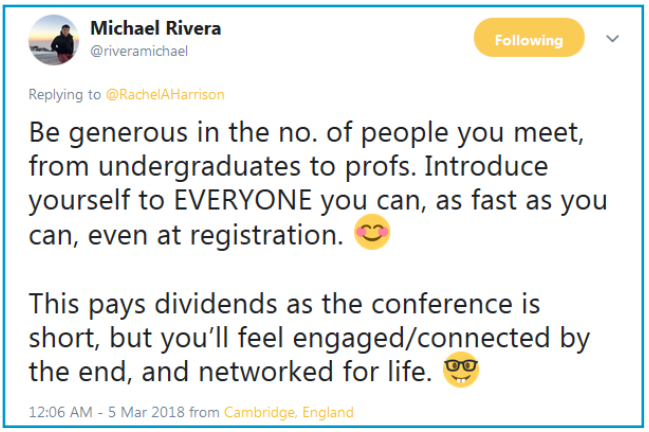
To give yourself the best conference experience possible, make a plan. Pick out key presentations you don't want to miss and plan out a schedule so you can make it to as many as possible. Follow @laurenmrobin's advice and look up speakers in advance, and aim to introduce yourself for a quick chat. Having a plan and a schedule for the conference will help you minimise your chances of missing that key talk related to your research.

Now, introducing yourself to leading researchers in your field can be easier said than done (it's certainly something I find challenging!). When you're planning for your conference, you could email senior researchers and ask if you can schedule in a chat over coffee one day. This is a particularly good idea if you have something substantial to discuss, like a potential collaboration. From Twitter, @thatthinkfeel suggests asking your supervisor if they can introduce you – this is a great way to enlist a little moral support in your networking endeavours. If you're lucky, your supervisor will do the "this is x, they work on y" icebreaking legwork for you – but make sure you have thought of something to say yourself, whether it's an 'elevator pitch' about your own work or a question about theirs.

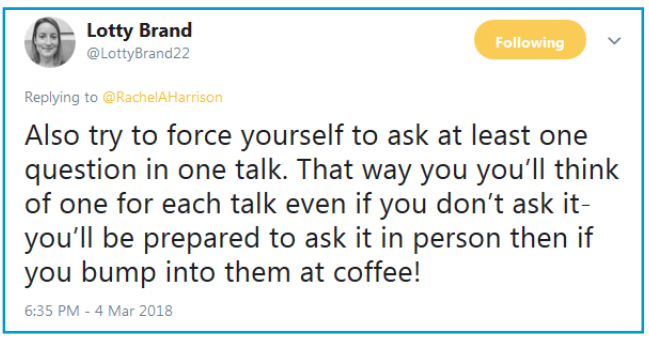


Don't panic if you don't manage to talk to that key researcher in your field. Conferences can be hectic for everyone, and you might find that senior academics have full schedules and simply aren't around during coffee breaks – or are constantly in the middle of in-depth conversations that you don't want to interrupt. If this happens, don't beat yourself up, just follow up after the conference with an email – ask a question about their talk or recent publication, and maybe arrange to chat when you next attend the same conference.

Conferences aren't just about getting facetime with the 'big names', though. Great collaborations (and friendships!) can come from chatting with your fellow early-career researchers. As @riveramichael points out, this will not only ensure you have someone to chat with at every coffee break, but also leave you with a life-long network of peers.



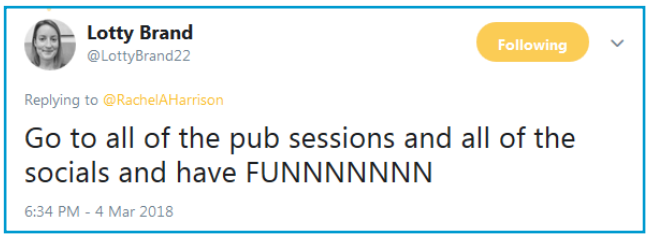
Now, conferences aren't just about networking during coffee breaks. You'll also spend a lot of time listening to other researcher's presentations, and perhaps you'll be presenting your own research. 'How to give a good conference presentation' ought to be an advice column in its own right, so instead I'll pass along this advice from @lottybrand22 on being an engaged audience member.



And conferences aren't just about work! If you're lucky, you'll be visiting a new city (and perhaps

even a new country) so take some time off to explore. Pick a session or two that you don't mind missing, and go and do a little sight-seeing. You'll feel refreshed afterwards and better able to take in the talks you do attend. And, as @thatthinkfeel points out, a little bit of alone time can be a great way to recharge.

Finally, most conferences include some evening social events - @lottybrand22 recommends attending as many as you can – don't hole yourself up in your hotel room every evening, go and have some fun! Again, this may also be a great opportunity to see some more of the host city, and it can also be a further networking opportunity. Some conferences have early-career research socials, which are great for meeting people at a similar stage to yourself in a more relaxed setting.



As @eithnekavanagh points out though, there can be pitfalls to the pub social or wine reception! Keep in mind the 9am plenary talk when you reach for that fourth glass of free wine.

Meanwhile, in our final piece of Twitter advice, @skipsahoi sees wine receptions and lunches as a key opportunity to reclaim the registration fee.

While I myself often find @eithnekavanagh's advice to limit alcohol consumption tricky to follow, I cannot in good conscience recommend that you attempt to drink the registration fee. Feel free to try to consume a few hundred euro's worth of croissants at the morning coffee break, though.

I hope this advice proves useful! Conferences are, in my opinion, one of the best aspects of a career in research, but they are undeniably stressful experiences at the same time. Remember that all early-career academics are probably experiencing the same anxiety – whether they're nervous about meeting a senior researcher in the coffee break or panicking about presenting their research. Relax, smile, and introduce yourself, and you'll find you have a roomful of new friends in no time.

Thanks to @skipsahoi, @laurenmrobin, @lottybrand22, @eithnekavanagh, @riveramichael and @thatthinkfeel for their words of wisdom.

If you have a question for the Cultured Scene Agony Aunt (+ Twitter commentators) email journalsec2@yslr.co.uk, and look out for tweets in the future asking for advice. □

RESISTANCE IS FUITILE?

HOW POP-CULTURE IS PORTRAYING THE HIVE-MIND, SUCH AS STAR TREK'S BORG.
FEAR IT OR EMBRACE IT?

In *The Best Of Both Worlds* Captain Jean-Luc Picard of the starship Enterprise is abducted by the Borg, mysterious aliens that assimilate other species to become a part of its collective hive-mind and gaining strength by exploiting each specie's distinctiveness.

Four Reasons to Serve the Hive

"We are the Borg. We will add your biological and technological distinctiveness to our own. Your culture will adapt to service us. Resistance is futile." (The Borg, Star Trek TNG)

The Hive wants YOU! Give up your pathetic notions of self-importance and join something greater. There will be no fear. There will be no unmet desires. There will be only eternal comfort from a billion voices in one chorus, with one purpose, with one spirit. No way. Not me. Not my species. We value our individuality. I am captain of my own ship and I will not have my identity suppressed by your Hive. This is the refrain of countless tales, well represented by Captain Picard giving the finger to the Borg and their offers of unified consciousness.

But are we too quick on the trigger as we vaporize countless waves of Hive-Drones? Science says: absolutely. Whilst scientists haven't been thinking much about the Borg, they have spent a lot of time thinking about ant hives, human societies, computer networks, DNA and other complex adaptive systems [1]. The Hive-Mind represents just another layer of organization on top of life, and it needs to obey the same rules. So in the interests of ruining both fun and science, we will deconstruct the Myths of the Hive-Mind in our popular culture and contrast them with crude descriptions of the science. Science that tells us the hordes of drones we cut down are self-actualizing individuals with their own hopes, dreams and sufferings. Just like us.

Myth One: The Hive is single-minded

"*What is a drop of rain, compared to the storm? What is a thought, compared to a mind? Our unity is full of wonder, which your tiny individualism cannot even conceive.*" - The Many, System Shock II

The Hive-Mind delivers us an ultimatum: aban-

don our individuality and accept control from the collective. Yet we deny them, because we value our personal wants and needs. Sure these wants and needs can cause problems. Like the nipple-themed race war that erupts when Unity loses control in Rick and Morty. But we're humans, dammit. We want to be ourselves [2].

The Reality: The Hive-Mind needs variety

Turns out the Hive-Mind doesn't want to crush our individuality. They want to nurture it. Operating as a collective is a great way to survive. After all, your body is just a bunch of cells that decided they were better off working together than going it alone. But the integrity of the collective needs variety in the parts that make it up. A planet- or galaxy-spanning collective mind just doesn't work if everyone is all the same.

Scientists are obsessed with studying the balance of variety in systems like Hive-Minds, ant nests and human societies. The take-away point of their research is simple: for a population to survive it needs to adapt as conditions change, and the essence of adaptation is variety. By restricting variety and producing endless copies of the same type, a system puts itself at risk. Firstly, by missing opportunities to adapt, and secondly by making itself vulnerable to shocks or exploitation [3].

The Law of Requisite Variety [4], developed by cyberneticist Robert Ashby, claims the need for variety in living systems is fundamental to nature. Basically, the more variable the environment, the more variety a system needs to survive. Furthermore, systems that are capable of more variety out-compete systems with less variety. Just think about football: the team with more plays in its book is the superior team in the long run because it can deal with more situations.

Hive-Minds exist in a variable universe. The Borg have to deal with a galaxy of planets, empires, weirdo aliens, god-like beings and tears in the fabric of space-time. The only way to deal with so much variety is to be capable of an equal amount of variation. For that, they need distinctive individuals doing their own thing.

So, yes. The Hive wants YOU. It does want to add your distinctiveness to its own. But it wants you to express that distinctiveness, baby! It's all about you and your individuality. In the end, it turns out that being part of a collective is no more threatening to our individuality than making dinner with friends. The bigger threat is petty name-calling and criticism.

Captain Picard, distinguished humanitarian (left), and Six-of-Nine, amoral drone (right), discussing the potential for unification.

Myth Two: Someone is in charge

"*Serve the Hive... Feel the groove... I control... the way you move.*" - The Overmind, StarCraft

What of being a puppet body to a controlling mental force? Whether it's a Queen or a King, joining the Hive requires subservience to a greater will. All in the Hive are mere slaves, doomed to do another's bidding through psychic control, cybernetics or chemistry. We are not in control because we are dominated and compelled to serve 'a greater good'. A greater good that is synonymous with the desires of our rulers and not our own.

This is clear in the insectoid swarms that litter the galaxy like a plague. The Zerg from StarCraft or Warhammer 40K's Tyranids are not creatures under their own power. Instead, they are mere extensions of their Queen. Her will filters through layers of lesser mind-controllers and ends with the teeth and fangs of the swarm, who are otherwise ravenous and instinctive creatures with no common bond.

The Reality: No one is in charge

But it's us apes who build social pyramids of control and dominance. For the insects, queens are merely another part of the hive; her function is to lay eggs. She doesn't know what the hive is up to or give it commands [5]. Yet despite not being ruled by anyone, the Hive can still adapt to its environment. This is because hives work through the principle of self-organization.

Each little ant or bee, queens included, are only acting in response to their own local environment and drives. When thousands of these interactions occur in a limited space or time, they promote the emergence of an organizational regime that gets things done without anybody being told what to do [6]. It's the same as with our market economy. The millions of transactions that take place every day can move supply to meet the demand. For the Hive to organize as a unified whole, it paradoxically requires each individual to have their own agency. The more instructions given to hive-members, the more the Hive limits its ability to adapt through self-organization.

When it comes down to it, hives are a prime example of autonomy. Each member must be free to do what they want, when they want, how they want.

Down with the Patriarchal Empire and its rigid hierarchies!
Up with the Matriarchal Swarm and its rigid hierarchies!

One of these creatures is an incorruptible and selfless public servant, dedicated to serve the needs of millions without asking anything in return. The other is a mind-controlling slug, whose uncontrollable desire to dominate threatens all humanity.

As drones in the Hive-Mind we wouldn't be slaves to the queen, we would only be slaves to ourselves. For some of us, that may be even worse.

Myth Three: The Hive's growth can not be stopped

"*There is only one Universe and it can contain only one life.*" - MorningLightMountain, Commonwealth Saga, Peter F. Hamilton

The motives of the Hive typically involve bringing all life into its fold. If not, then it's about eradicating other life entirely. Filled with its singular purpose, the Hive-Mind is an unrelenting, unstoppable force that spreads without constraint. All life in the universe rests on finding a way to halt the Hive. It's like an invasion or a virus. Indeed, from the perspective of a human life, cohesive enemies and disease can seem unrelenting in their expansion. But is such a thing even possible?

The Reality: The Hive desires balance

It turns out that unconstrained growth is just another delusion of the human mind. Consider the growth of a leaf-cutter ant hive. They are not too different from the Borg. Except instead of assimilating life and technology into more Borg, they are assimilating leaves into more ants. The further the hive extends, the less efficient assimilation becomes because it takes longer to transport resources [7]. Human cities work in the same way - they expand to the point where it becomes less efficient to do so.

Although the Borg tell us that resistance is futile, it's clearly not. To overcome the resistance against them, the Borg must invest energy into their conquering. This energy has to come from somewhere. Which brings us to the concept of trade-offs, and the realities of living in a finite universe. Simply maintaining all the processes required to persist takes resources. Ants need to raise young, reproduce, respond to threats, dig tunnels and all that. The Hive-Mind is going to need to service itself as well, and they can't do this if their efforts are concentrated on an expanding front.

But even more difficult is assimilation itself. Assimilation takes time and resources, and also increases the complexity of the Hive. An increase in complexity can be seen as a kind of level-up for the Hive. But it comes with its cost: as something becomes more complex it becomes slower, less specific in what it can do and more expensive to maintain [8]. Furthermore, the system as a whole needs to change in order to incorporate the new chemical and technological elements coming from a conquest. These changes can make the system more robust in some areas, but more fragile in others. Such disruptive change is not always a good idea.

So we see, even the Hive-Mind has limits to its growth. We live in a finite, variable and unpredict-

able universe and have to deal with that. So do they. The Hive-Mind can't spread to encompass the whole business any more than we can. Instead, they will have their hands full just trying to stay alive, and seek something that resembles balance.

Myth Four: The Hive-Mind is the ultimate state of evolution

"*Recreational substances were phased out here. There's no need for escape from the self when your world is one.*" - Unity, Rick and Morty.

You know what, this Hive-Mind thing is starting to look pretty good. Indeed, many of our stories don't pose the Hive-Mind as a threat, but rather as savior. Transcendence into a group-mind is often portrayed as the next stage of human evolution, or the path taken by superior progenitor species that inhabited the galaxy eons past. It represents an end to suffering through the unification of all things. There will no longer be any separation between ourselves, others and the unified nature of existence. Sounds good. But can the Hive-Mind truly bring us our salvation?

The Reality: The Hive-Mind is just one way of life among many

Probably not. Unification of this sort may be able to bring an end to our suffering, but only by ending self-experience [9]. To be self-aware is to make a distinction between the self and others, but in a unity there are no others. In other words, it is being alone. Without a distinction of the self, there is nothing else either. As an experience it is about the same as being dead, or if you rather, being unborn. If we want to remain self-aware, we must remain as separate individuals, complete with the suffering that comes with it.

But what about if we dial things back a bit from achieving God-Hood? Does the Hive-Mind represent the next stage of evolution? Probably not. When it comes to evolution there is no best, there is only whatever works [10]. There is no ladder to climb, only a toilet to spiral [11]. A life-form that

What will happen to the Cybermen when they assimilate the internet?

is good in one context is not so good in another. There is always a weakness to exploit or an opportunity left untouched. There is no ultimate form that beats everything else.

So, Hive-Mind drones not only represent a variety of distinctive individuals with their own agency, they are vulnerable beings and may even be prone to existential suffering. The drones of a Hive-Mind, and the Hive-Mind itself are just other living things in a universe of diversity, no better and no worse. Just surviving and doing their thing, same as everyone else.

Conclusions: Serve the Hive, or Don't. Who cares?

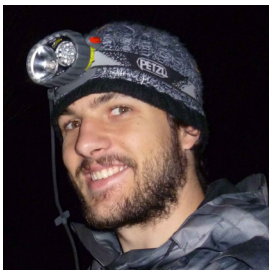
"*They just put you at the centre of their lives because you're powerful, and then because they put you there, they want you to be less powerful.*" - Rick Sanchez, Rick and Morty.

Human life exists on the bleeding edge of tension between individuality and the collective because we are an expression of both¨[12]: in our societies [13], our minds [14], our bodies [15]. Hive-Minds offer no escape from this tension, any more than being a multi-cellular organism frees our cells from their tiny struggles. As long as we are alive, we will have our agency and individuality. We will have our struggles against nature and with defining our self-identity. We will have our vulnerabilities to accept. It doesn't really matter whether we are in a Hive-Mind or not.

Actually, we probably wouldn't even notice if we

lived in a Hive-Mind. The choices we make as individuals have consequences at higher levels of organization, such as family, tribe and nation. These higher organizational levels deal with complexity beyond individual understanding [16], yet it is individual choice that allows collectives to deal with complexity. So the true power of an effective Hive-Mind comes from not being known and allowing individuals to make choice without pressure. Our actions that feel most natural may be contributing to self-organized collectives without our realization. Some philosophers from multiple schools of thought already believe that humans works as a collective mind, at least to some degree [17][18][19].

In our stories, the Hive-Mind has been unfairly represented as oppressor or savior. They are portrayed as a destroyer of individuality through collective control, mental domination, or transcendence of the self. Yet the reality is a collective life that emerges from individual expression. And for individuals, life is complex and kind of isolating. Even for those in the Hive-Mind. □



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Rituals to Remember?

The following is description of a manuscript in the final stages of drafting prior to submission. Rohan invites you to read the following, and consider attending to the preprint in order to help improve the research with constructive feedback.

In 2015 I listened to an interview[1] with Dr. Freya Harrison, a chemist at The University of Nottingham, who had recreated a 1100 year old medicine for the treatment of a sty[2]. Much to the surprise of her whole research team, not only was the medicine effective, it was effective against MRSA, a particularly problematic strain of treatment-resistant bacteria. Just imagine how it felt when this worked:

"Make an eyesalve against a wen [a sty]: take equal amounts of cropleac [a type of onion] and garlic, pound well together, take equal amounts of wine and oxgall, mix with the alliums, put this in a brass vessel, let stand for nine nights in the brass vessel, wring through a cloth and clarify well, put in a horn and at night apply to the eye with a feather; the best medicine."

Would you have wagered this recipe would produce an effective medicine? Or rather, would you have expected a placebo response and a curious odour? In her resulting article, Dr. Harrison claimed we shouldn't think of these ancient people as particularly 'backward or superstitious'; someone might believe that, if a procedure required the recitation of 15 Hail Marys then the incantation was playing a divine role, but in reality (and unbeknownst to the actor), it may simply have been a reliable way to measure a 2-minute interval in an era without timepieces. I personally think this is quite a generous interpretation, since each ritual action necessarily needs to be independently justified by a hidden mechanism, but it is certainly an idea with merit.

What if the rituals were playing an important role (and possibly even the same role)? Having spent an inordinate amount of time over the last few years thinking about ritual and cultural evolution, an alternative occurred to me.

Medieval medical procedures initially captured my attention because it must necessarily have been the case that for most of human history, knowledge of how to produce things - medicines, drugs, clothes, tools, buildings - had to be transmitted without the aid of an external reference. This knowledge existed, variously distributed, inside human heads. And as time passed, both historically and over the course of one's life, those heads only became more full. How efficient was it to remember things that were instrumentally unimportant, and then to repeatedly perform those things? Surely even a gentle selection pressure for simpler processes and fewer ingredients would result in - over time and repeated iterations - greater efficiency? Moreover, I assumed that when an ostensibly instrumental action sequence was primarily composed of causally opaque, confusing, and unfamiliar actions, then a naive observer would be overwhelmed, and recall would be impaired. If you've ever tried to teach a child how to tie their shoelaces, you know what I'm talking about.

And so, I wondered, might rituals be doing something that facilitates their own apparent tenacity? We, as humans, like to be able to predict our environments. We're constantly scanning, tracking, and predicting what people will do, and how they are trying to do it. And yet, rituals tend to violate the prediction we make about others' intentions (Why did you do that?) and our understanding of causality (How does that work?). Rituals, by violating our expectations, produce 'cognitive capture': they arrest our attention, and motivate us to restore an understanding of the world that is predictable. Perhaps unsurprisingly, we tend to better remember things that occur at the exact time and place when our attention is arrested, focused, and motivated. If rituals can do all this, is it possible that their inclusion in complicated behavioral sequences benefits

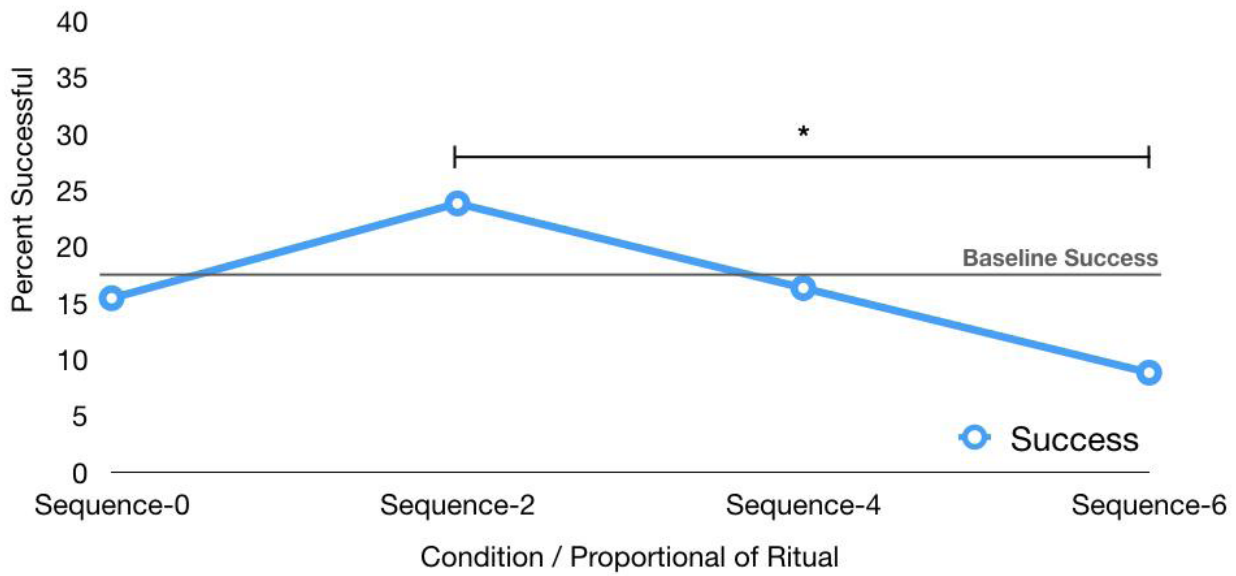
the re-production of behaviors and technology? Were rituals helping people to learn new behaviors?

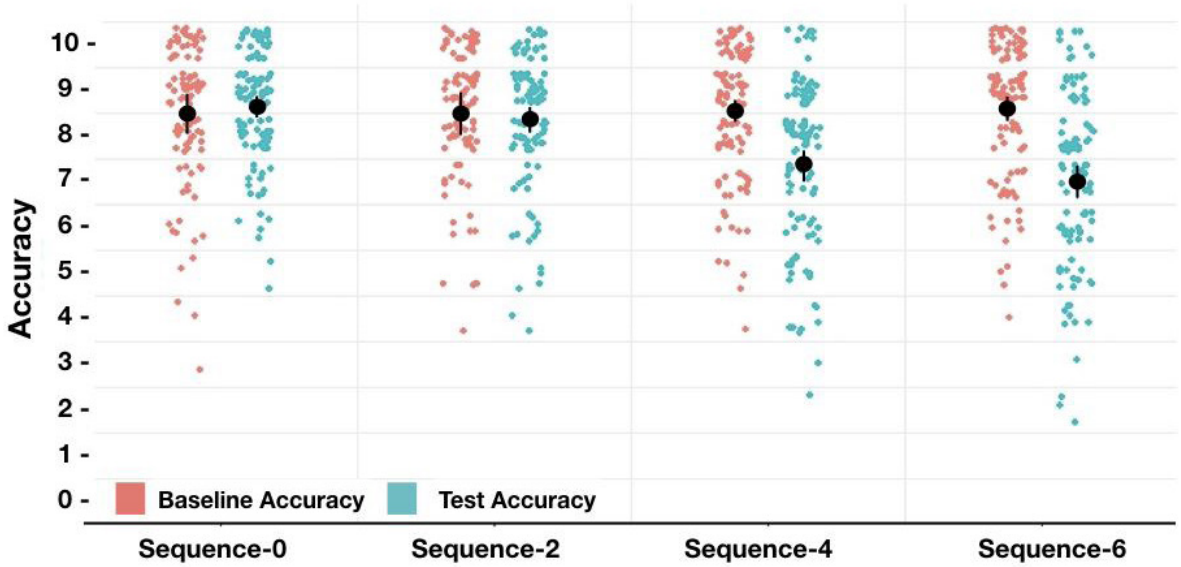
And so I decided to run a memory experiment. I'd show a bunch of people a complicated, ostensibly important, and instrumental action sequences and ask them to describe their memories. I'd vary the proportion of rituals they observed within each sequence in order to quantify whether some small proportion of ritualized action improved recall. It also stood to reason that a high proportion would overwhelm people, which would harm recall (consider again the child learning to tie their shoes). And since I was confident (and motivated by a $1,000,000 challenge) I pre-registered everything[3].

In the beginning I was sure that, if this phenomenon were real, it would be large and interesting, and not simply an effect only observable at the statistical level. Nonetheless, I wanted two measurements from each participant. But given the nature of the research question, it was obvious that I couldn't show participants variations of the same thing twice, as the order and carry-over effects would swamp the anticipated phenomenon. And so I created two 'template' sequences: both ostensibly modelled on 'ancient medicines'. Both of these sequences were of equal duration (2 minutes), and were made up of 6 behavioral units of action (i.e., mixing things in a bowl), while each behavioral unit was made up of a number of gestures (i.e., put the salt in the bowl, put the garlic in the bowl, mix together). While the template sequences were similar, they were distinct and complicated enough that there would be no carry-over or order-effects.

Having created these template sequences I then created 6 additional variations of each, where I manipulated the number of embedded ritualized actions. Each variation involved disrupting one of the normal, instrumental actions, so that it was repetitive, redundant, and/or stereotyped, and most importantly, completely causally opaque to the observer. An instrumental action, for example, involved putting two things into a jar, putting on a lid, holding the jar, and shaking them together; the ritualized variation involved putting the same two things into a jar, putting on the lid, putting the jar on the table, and performing a shaking-motion with my hands in the air above. This ritualized action shared the same duration, ingredients, and motor actions, and yet action-structure was disrupted such that determining the causal relationship between the action and the expected outcome was impossible.

Each subsequent variation changed one of the 6 behaviors from an instrumental act into a ritualized act. Thus, the 'template' sequences were fully instrumental (6 instrumental actions), while the





first variation of each had 1 ritualized actions and 5 instrumental, the second variation had 2 ritualized actions and 4 instrumental, and so on, until each of the 6 gestures had been ritualized.

Next came the question of measurement. The first dependent variable was a liberal measure of accuracy / discrimination. Could the participant identify things that had actually happened? Here, I ignored anything that was falsely reported as present. The second measure was a binary score that determined whether or not what the participant reported only correct statements, and in the correct order. That is, could they reproduce the intended outcome without error? Here I was attempting to approximate an ecologically valid measure of novel learning. For context, consider how accurate you need to be to bake a soufflé or tie a Windsor knot. Being 95% correct on such a procedure is not sufficient - correct reproduction requires the process to be just so. Finally, I wanted a measure of 'detail'. Initially I pre-registered a coding rubric, but it quickly became apparent that this was unwieldy and excessively time consuming (and unlikely to do what I had hoped). I opted then, simply, for a word count (a hopefully defensible decision in light of my deviation from the pre-registration). If it were the case that rituals could aid memory for complex sequences, then a liberal measure of 'accuracy', a conservative measures of 'success', and an objective measure of 'detail' might uncover the hypothesized effect.

I conducted two experiments. The first experiment demonstrated the validity of the stimuli, and showed that participants reported diminishing confidence in the accuracy of their responses as the proportion of rituals increased. However, on my dependent measures, predicted and suggestive patterns emerged, but were not significant. That said, we believe these were the result of a few 'inelegant design decisions', rather than evidence of the absence of the effect. For this reason I direct the reader to the preprint for further information, and will hereafter focus on study 2.

In study 2, all participants saw one fully instrumental sequence (one of the master-templates), and one (of four) randomly selected 'test' videos from the other template-sequence. The 'test' videos were sequence-0 (the alternative fully instrumental master-template), sequence-2 (2 rituals, 4 instrumental actions), sequence-4, and sequence-6. We recruited just over 400 participants from mTurk.

(This number, based on simulation data, indicated that 100 observations per cell was sufficient to reliably detect a difference as small as 3% between contiguous conditions). Accuracy was operationalized as a set of 10 true/false questions (where each condition had the same questions, yet the correct answer depended on the condition), and 'success' was operationalized in a task that required the participants to perfectly order 12 randomly-presented true statements about the video. While the 'detail' measure was a simple word count in response to a free-recall description task.

So, what did I find? The very pretty scatter plot shows participants scores on the accuracy task. The red points are participants' scores on the fully instrumental baseline, and the teal points are their matched scores on the test sequence. It is clear that accuracy drops when the proportion of rituals is high, though it's not clear that there's any boost (or bust) when low.

Encouragingly, when participants were asked to order 12 random-presented true statements in correct order, the condition with the highest proportion was sequence-2, and the lowest was sequence-6. Specifically, in the test condition, those who saw sequence-2 were over 3 times more likely to be successful than those who saw sequence-6.

Finally, we observed that word count increased in a linear manner as the proportion of rituals increased. Moreover, a participants' confidence in their own recall significantly and linearly declined as the proportion of ritualized actions increased.

So what does this mean for the hypothesis that causally opaque rituals may help people learn new behavior? It seems quite clear that the cost of ritualized actions is not trivial, and that they do appear to harm recall when present in high proportions. But what of the idea that they are helpful at low proportions? Well, the data are suggestive, but in no way conclusive. Study 1 and study 2 both show highly similar patterns, but only study 2 had anything statistical to say on the matter (though this is but one experiment on a novel and speculative hypothesis). The present data also have very little to say on the historical frequency of such things. Humans are, of course, prolific imitators, but they are not entirely injudicious either. What I can say is that these kinds of rituals are highly common, and appear to arouse specific cognitive responses when observed. Though, as I outline in the manuscript, acknowledging that ritualized actions appear to have (if nothing else) a cumulative negative impact on recall has implications for quite well known theories of ritual cognition, as well our understanding of social learning strategies. While the question of whether or not rituals provide some benefit at low frequencies is unanswered, it cannot yet be ruled out. Personally, I hope to continue research on this, to identify exactly how cognitively costly such rituals are.

Here I'll conclude with a small thought experiment: Recall, as best you can, the recipe provided at the top of the article. It features 11 steps/ingredients, and some degree of ritualization. Take a moment to mentally recreate it…. Then identify the proportion of apparently ritualistic acts, and consider, as best you can, whether or not sequence would be easier, or more difficult, to remember without them. □

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REFERENCES

1) See radiolab.org/story/best-medicine/

2) An infection of the eyelash follicle

3) See cos.io/prereg

4) This research has been conducted with input from Mark Nielsen, Chris Kavanagh, and Harvey Whitehouse.

5) The pre-print of this article is available here. Alternatively, follow Rohan on twitter (@psycasm) where he will announce the release of the preprint, and also RT clever and/or interesting things other people say.

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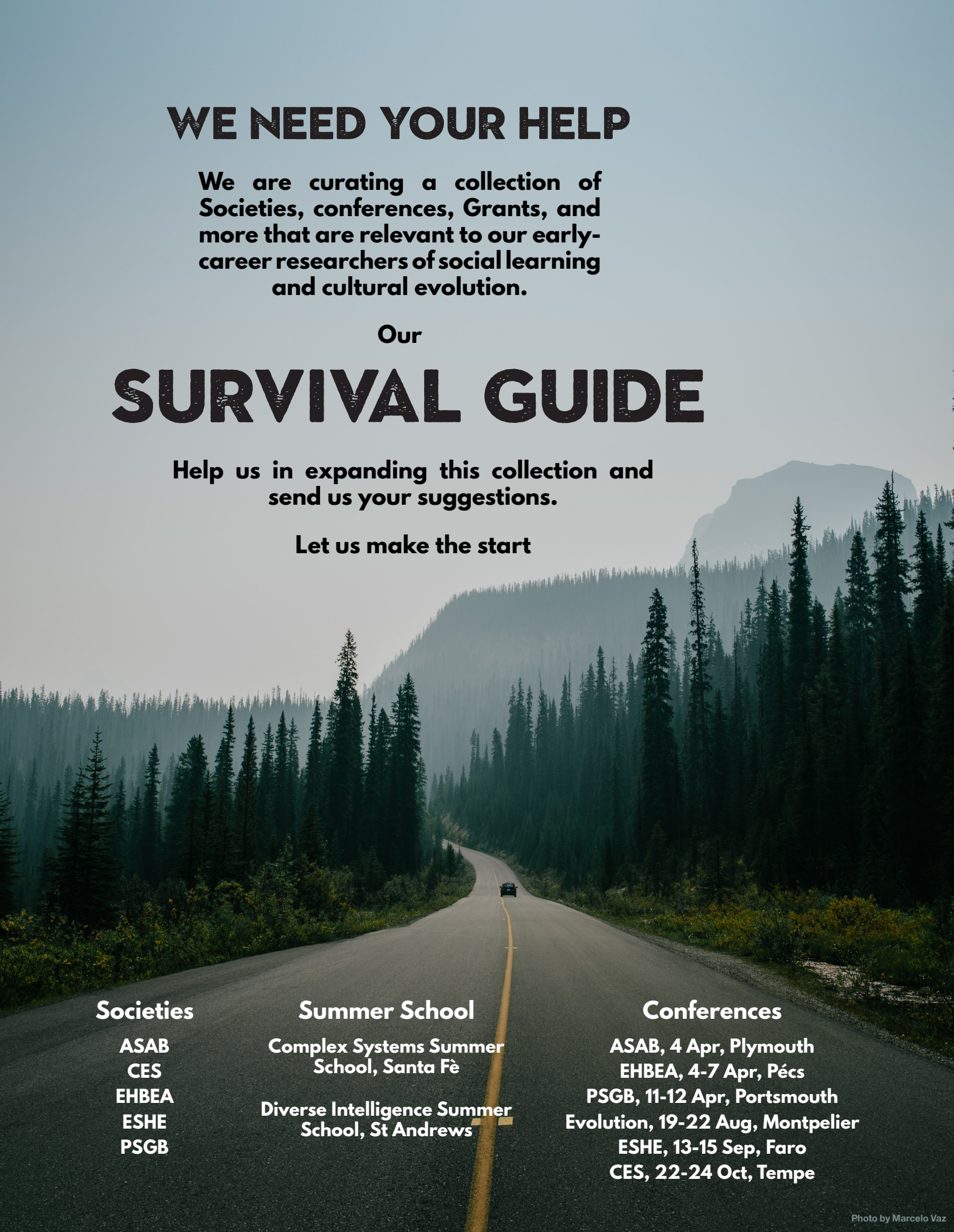

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