

1 2nd Annual Workshop of the Association of Early-Career Social
2 Learning Researchers in St Andrews, Scotland

3 Marco Smolla¹, Edith Invernizzi², Marina Bazhydai⁵, Marco Casoli², Dominik Deffner³,
4 Goncalo Faria², Nick Jones², Jasmeen Kanwal², Anna-Margarete Staehler², and Ryutarō
5 Uchiyama⁴

6 ¹Department of Biology, University of Pennsylvania, Philadelphia, PA, 19104, USA

7 ²School of Biology, University of St Andrews, St Andrews, Fife, UK

8 ³Department of Human Behavior Ecology and Culture, Max Planck Institute for
9 Evolutionary Anthropology, Leipzig, Germany

10 ⁴Department of Psychological and Behavioural Science, London School of Economics,
11 London, UK

12 ⁵Faculty of Science and Technology, University of Lancaster, Lancaster, UK

13 *E-mail: smolla@sas.upenn.edu

14 July 26, 2018

15 **Introduction**

16 The 2nd Annual Workshop of the Association of Early-Career Social Learning Researchers was held at
17 the University of St Andrews in Scotland, June 21st-22nd, 2018. St Andrews has a strong and diverse
18 community of social learning and cultural evolution researchers, which made it an ideal place for this year's

19 workshop. The workshop included 2 keynotes, 6 activities, a senior researchers' podium discussion and an
20 open-door poster session. 37 researchers (Masters, PhDs, and Post-docs), from 9 European countries and
21 21 institutions ventured to the two-day meeting. The audience represented a diverse scientific background
22 including anthropology, archaeology, evolution and ecology, linguistics, psychology, and neuroscience. The
23 primary intentions of this workshop were (1) to foster interdisciplinary discussions on the state of social
24 learning research, new techniques, and methodologies, (2) to create an environment to exchange on early-
25 career issues, and (3) provide a platform for cross-disciplinary networking and research showcasing. In the
26 following, we will summarise comments, insights, and results from the two-day meeting.



27
28 Figure 1: Participants of the workshop at the Medical Science Building, St Andrews.

29 **Keynotes**

30 The workshop opened with Dr Eoin O'Sullivan's (University of Stirling) keynote: *Searching for a psycholog-*
31 *ical science of social learning in the 20th century's schools of behaviour and cognition*. O'Sullivan provided
32 a critical review of the history of the key concepts of the main schools that impacted the field that is now
33 known as social learning. Spanning an ark from the early starts with Geroge Romanes and Lloyd Morgan,
34 to behaviourism (Thorndike and Skinner), and the emerging field of ethology and cognitivism (Tinbergen
35 and Lorenz) he presented the rich heritage of ideas and perspectives on social learning. While reaching
36 back many decades, these ideas still impact today's research in many ways, of which O'Sullivan pointed out

37 the three. First, while the *nativist-empiricist dichotomy* is considered surpassed by most, implicit biases
38 are often introduced that indicate assumptions on the extent to which behaviours are innate or learnt. An
39 example is the often made assumption of domain-specificity over domain-generality. Second, *observational*
40 *studies* are still important and are the basis for the identification of trends, context-dependencies and other
41 features relevant to the study of behaviour that are unknown or understudied with the current experimental
42 frameworks. Finally, the *nominative fallacy* - the tendency to overestimate the extent of available knowl-
43 edge for concepts with a well-established name - often leads to the failure of identifying knowledge gaps for
44 such widely-used concepts. An example is the bad fit of our current model of imitation with the observed
45 hardship of this task in monkeys. At the end of his talk, O'Sullivan remarked that one of the upcoming
46 themes in social learning research is based on embodied learning, an approach that lies at the crossroads
47 of environment, cognition, and body.

48 Alexis Breen (University of St Andrews) held the second keynote, entitled *Social influences and conse-*
49 *quences in animal construction*. Animal construction is a widespread phenomenon, ranging from simple
50 stick tools to intricate woven nests. Yet, the social factors involved in acquiring this skill are little under-
51 stood. Breen presented her PhD work that focused on the social factors involved in the development of
52 nest building abilities in young zebra finches. The results of her experiments show that the choice of nest
53 building material was affected by juvenile experience with nest material in combination with the presence of
54 an adult, whereas, the sole experience of the nest material during early-life had no effect on their preference.
55 The second study focused on nest building competence and results suggest that the presence of an adult
56 bird is sufficient to overcome the lack of individual experience with nest building material. Breen's talk
57 highlighted the complex interaction of social and environmental factors on the species-specific development
58 of skills, and that future experiments need to focus more on them.

59 **Social Learning – Milestones**

60 Ideas, concepts, and theories regarding social learning of valuable life skills reach far back, past Darwin's
61 anecdotal mention of it. It is only in the 1980's, however, that the study of culture and social transmission
62 are formalised within an evolutionary frame by Boyd and Richardson (1985), Cavalli-Sforza and Feldman

63 (1981), and Rogers (1988). The 1990's saw the introduction of several key concepts in the field, as the
64 number of studies on social information transmission increased. For example, the study on social foraging
65 by Caraco and Giraldeau (1991), introduced the idea of producer-scrounger dynamics that can still be
66 found in social learning models today. In 1994, Heyes published her influential paper on the psychological
67 mechanisms of social learning: often referenced for the definition of social learning, it kicked off the debate
68 on differences in the mechanisms underlying social and asocial learning. The field expanded as concept of
69 culture in non-human animals was pioneered at the turn of the century, by Whiten and colleagues (*Cultures*
70 *in Chimpanzees*, 1999), followed by Rendell and Whitehead with *Culture in Whales and Dolphins* (2001).
71 In 2004, Laland's paper *Social Learning Strategies* offered the first synthesis of the various different studies
72 on social learning and described contextual differences in when and what an individual learns, and from
73 whom. More recently, the debate on social learning within a functionally versus a socially adaptive context
74 was initiated by Horner and Whiten's discovery that children imitate behaviour that is clearly unnecessary
75 to their goal while chimpanzees do not (2005), somewhat later this will become known as overimitation.
76 And only recently has the field seen another surprising turn, when the study by Alem and colleagues (2016)
77 presented social transmission of complex behaviours in social insects, opening up new questions about the
78 need for large brains to learn socially. Currently, the field experiences an increase in analytical and empirical
79 methods, diversification and expansion.

80 **Social Learning – Methods and Techniques**

81 The diverse backgrounds of social learning researcher has lead to a multitude of approaches and meth-
82 ods. Starting with theoretical work, it was emphasised that it will be necessary to combine mathematical
83 proof-of-concept models (testing the logic of verbal explanations) and computational approaches (exploring
84 evolutionary dynamics in complex scenarios) to identify and develop new theories. In experimental work,
85 a diverse set of methods is currently employed. For example, to investigate how new traits spread and
86 how cultural adaptations arise transmission chain and open diffusion experiments are used, and to make set
87 experiments in more ecologically relevant contexts observational fieldwork is still the hallmark. Of special
88 significance for these studies are statistical modelling techniques, which use time series data to draw infer-

89 ences about pathways of learning, like experience-weighted attraction models and network-based diffusion
90 analysis. In the foreseeable future a couple of methods will likely play an even more important role than
91 they currently do. The combination of machine-learning and neuroimaging techniques will help uncover
92 the computational and physiological mechanisms underlying social learning, which might also elucidate how
93 learning differs in a social from a non-social context. Body and eye-tracking of interacting individuals in
94 combination with adequate analyses of time-series data, such as cross-recurrence quantification and the
95 Granger causality test, will allow to unravel attentional and motivational biases as well as communicative
96 cues in social learning contexts. The internet and other big data sources will provide opportunities to study
97 cultural evolution in unprecedented complexity, but also pose new conceptual and methodological chal-
98 lenges. The breath of methods and techniques, which are sometimes entirely confined to a single discipline,
99 illustrates how important interdisciplinary exchange is, and how this might increase future cross-discipline
100 adoption of those methods.

101 **Social Learning – Future Directions**

102 For the future of social learning research three important themes were discussed. The first theme regarded
103 data collection. To move the field forward there is a clear need for more long-term as well as for more
104 longitudinal studies. This will allow insight into how social learning changes over time within individuals,
105 groups, and societies. Also, current advances in technology such as the development of miniature tracking
106 devices promise new possibilities for studying social networks and social interactions in the wild, particularly
107 for species difficult to observe and monitor in natural conditions. Finally, in order to appreciate the diversity
108 and complexity of learning processes, it is necessary to move beyond canonical model systems for social
109 learning. The second theme focussed on data processing. Advances in data processing will make it possible
110 to analyse vast amounts of low-cost information from web-based activities and social media, an important
111 source of data to study information transmission in our own species. The third theme aimed at terminology.
112 In line with the workshop's aims, collaborations and communication between related research fields were
113 recognized as essential aspects for the future of social learning research. This, however, requires substantial
114 efforts to clarify, harmonise, or even unify terminology across disciplines on central concepts, such as social

115 learning, traits, and culture. This will facilitate collaborative efforts and inter-disciplinary communication.

116 **Issues for Early-Career Researchers**

117 During one of the open-discussion sessions issues scientists encounter during the early-stages of their career
118 were discussed. Some participants asked for advice on how to handle the many different tasks when finishing
119 their PhD thesis, such as writing up chapters and papers, applying for funding, and looking for jobs. But
120 also how to use conferences strategically, and how to build-up an interdisciplinary scientific career? More
121 existential questions on the restless life as a researcher were raised near the end of the session: how to
122 deal with constant relocation? Can you have a partner who is also a scientist? When is a good time to
123 have children? And even more existential: have you considered leaving academia? The session showed that
124 universities do well at teaching what it means to *do science*, but still have some way to go at teaching what
125 it means to *be a scientist*. Workshops like this one will hopefully help achieving this goal.

126 **Public Outreach – Improving Wikipedia**

127 Given that scientific knowledge often is a privilege to those that have access to academic journals and
128 conferences, one of the workshop activities aimed at engaging directly with the most popular public online
129 encyclopedia, Wikipedia. The goal was to improve existing articles, or create new ones for common themes
130 and methods in social learning. While one group successfully added an entire new page (on network-based
131 diffusion analysis), the activity was generally more demanding than initially anticipated, mainly because
132 important pages inadequately represent the current state of social learning research (see e.g. the page on
133 *social learning theory*) and require much more work. Several participants expressed interest in coordinating
134 future efforts to improve the quality of current social learning pages.

135 **20 Years of Social Learning, Senior Researchers' Panel Discussion**

136 The Senior researchers' panel discussion drew attention towards the bigger picture in the field summa-
137 rizing core developments and expressing the shared fascination for this diverse and growing field. Prof

138 Malinda Carpenter (St Andrews) described how the field changed during the mid 2000s, when developmen-
139 tal psychology recognised the importance of social aspects in imitation-based learning. This led to a new
140 understanding of imitation as a precursor to the development of complex higher order social phenomena. Dr
141 Luke Rendell (St Andrews) pointed out how moving the focus to non-human species triggered an explosion
142 of studies on social learning and possibly culture in species across the animal kingdom. Here, human social
143 learning has become one of many branches of social learning. Dr Monica Tamariz (Heriot-Watt University)
144 pointed out major theoretical advances, such as dual inheritance, cultural attractor, and induction theory.
145 The field is now moving to integrate and synthesise these different ideas into a unified science of social
146 learning. Prof Andrew Whiten (St Andrews) further emphasized the historical significance of both the
147 cognitive revolution spearheaded by Bruner and the focus on ethology by Tinbergen, endorsing to combine
148 the rigour of experimental work with the methodological flexibility of the field work.

149 **Poster Awards**

150 During the open-door poster session participants exhibited the broad range of studies on animals, including
151 fruit flies, bats, capuchin monkeys, and chimpanzees, as well as humans, with a broad range of questions,
152 reaching from tool-use and corporate culture to pedagogy and innate learning biases. Some of the be-
153 havioural studies deployed advanced quantitative methods for data analysis, such as hierarchical Bayesian
154 modelling and cross-recurrence quantification analysis. Some behavioural studies were augmented with
155 other approaches, such as simulation models, meta-analyses, and phylogenetic approaches. The posters
156 were judged by Dr Ellen Garland and Prof Andrew Whiten. Dr Sabine Nöbel's (Toulouse) finding of high
157 conformity in the mate-copying behaviour of fruit flies, together with Murillo Pagnotta's (St Andrews)
158 analysis of gaze coordination in a human social learning task, were awarded a prize for Best Poster, while
159 a special mention was given to Julia Penndorf (Max Planck Institute for Ornithology) for her meta-analysis
160 challenging the theory of age-dependent social learning.

161

162

163 The 3rd ESLR workshop will be in Leipzig, Germany, in June 2019. See ESLRsociety.org for updates.