



HAL
open science

Animal Ethics and Behavioral Science: An Overdue Discussion?

Christine Webb, Peter Woodford, Elise Huchard

► **To cite this version:**

Christine Webb, Peter Woodford, Elise Huchard. Animal Ethics and Behavioral Science: An Overdue Discussion?. Bioscience, 2019, 69 (10), pp.778-788. 10.1093/biosci/biz082 . hal-02170684

HAL Id: hal-02170684

<https://hal.science/hal-02170684>

Submitted on 2 Jul 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Title: Animal Ethics and Behavioral Science: An Overdue Discussion?

Authors: Christine Webb¹, Peter Woodford², & Elise Huchard³

¹ Department of Human Evolutionary Biology, Harvard University, Cambridge, USA.

² Union College, Schenectady, NY, USA.

³ ISEM, Univ Montpellier, CNRS, IRD, EPHE, Montpellier, France.

Christine Webb (christinewebb@fas.harvard.edu) is a primatologist at Harvard University. She studies conflict management behaviors, empathy, and personality in chimpanzees.

Peter Woodford (woodforp@union.edu) is an Assistant Professor of philosophy and religion at Union College in Schenectady, NY. He works on the evolution of religion and questions about the natural foundations of ethics.

Elise Huchard (ehuchard@gmail.com) is a behavioral ecologist at the CNRS in France. She studies the evolution of social and mating systems in baboons among other mammals.

2 **Abstract.** Animal ethics—the field of philosophy concerned with the moral status of animals—is
3 experiencing a momentum unprecedented in its history. Surprisingly, animal behavior science
4 remains on the sidelines, despite producing critical evidence on which many arguments in animal
5 ethics rest. Here we explore the origins of the divide between animal behavior science and
6 animal ethics, before considering whether behavioral scientists should concern themselves with
7 it. We finally envision tangible steps that could be taken to bridge the gap, encouraging scientists
8 to be aware of, and to more actively engage with, an ethical revolution that is partly fueled by the
9 evidence they generate.

10 **Keywords**

11 animal behavior, behavioral biology, animal ethics, animal welfare

12 The moral status of animals is a longstanding question dating back at least to Aristotelian
13 philosophy (see Regan & Singer, 1989 for an overview of historical and contemporary writings
14 on the topic). However, it has been brought into especially acute focus in recent decades. The
15 modern development of the animal ethics debate is fueled by many factors—among them, novel
16 scientific insights into the complexities of animal minds and emotions (Bekoff & Pierce, 2017);
17 the ever-increasing scale of industrial farming (Harrison, 2013/1964); and the Anthropocene, an
18 era heralded by unprecedented human-induced changes to the earth’s climate, environments, and
19 resident wildlife (Ceballos et al., 2015). The cumulative impact of these trends has raised the
20 urgency of moral concerns over the nature of human-animal relationships, particularly in the
21 context of our use, overuse, and misuse of animals. The exploitation of animals for food and
22 other products represents just part of the prevailing narrative: a major shift is taking place in how
23 people view the role of animals in research, entertainment, and even companionship. This turn
24 was detectable in early publications like Ryder's (1975) *Victims of Science* and Singer's (1975)
25 seminal *Animal Liberation*, and later built upon by those of other scholars (e.g., Donaldson &
26 Kymlicka, 2011; Francione, 1995; Jamieson, 2002; Korsgaard, 2018; Nussbaum, 2018; Regan,
27 1983; Rollin, 1992; see also Armstrong & Botzler, 2017 for a comprehensive anthology of
28 readings on animal ethics). The last two decades have witnessed an exponential increase in
29 literature and journals focusing on animal ethics—the field of philosophy concerned with the
30 moral status of animals (Figure 1).

31 This transition in ethical thinking about animals has been, at least in part, driven forward
32 by evolutionary theory and discoveries made in the behavioral sciences. Darwin’s theory of
33 evolution by natural selection offered a new and powerful challenge to the anthropocentric
34 assumption that humans are the pinnacle of creation—an assumption central to many historically
35 and presently influential theological conceptions of the world (Rachels, 1990). As the earlier
36 scientific revolution guiding human understanding of the natural order showed that the earth is
37 not the center of the cosmos, this revolution more dramatically levelled human ontological status
38 by insisting that humans are one of a countless variety of other animals. The disintegration of our
39 pre-Darwinian understanding of nature, coupled today with the extent of anthropogenic changes
40 faced by the environment and animals in the industrial world, has revealed deep-seated
41 incompatibilities between dominant frameworks of value (still rooted in a pervasive sense of
42 human superiority) and the current state of knowledge regarding the capacities of other species

43 and their vulnerability to human actions (e.g., Bekoff & Pierce, 2017; Jones, 2013; Rachels,
44 1990).

45 Recent progress in scientific research on animal behavior has provided evidence used by
46 animal ethics by documenting previously unknown aspects of animal life that have fundamental
47 ethical implications. Studies on the cognitive, emotional, and social capacities of other species
48 have discredited long-held assumptions about capacities thought to be unique to humans. Non-
49 exclusively, this list includes the design and use of tools (Sanz, Call, & Boesch, 2013); the
50 prevalence of animal cultures (Laland & Bennett, 2009) and the capacity to innovate (Reader,
51 Morand-Ferron, & Flynn, 2016); the complexity and efficiency of animal vocal communication,
52 including symbolic communication (Seyfarth, Cheney, & Marler, 1980) and forms of
53 protosyntaxes (Ouattara, Lemasson, & Zuberbühler, 2009); the capacity for self-awareness
54 (Gallup, Anderson, & Shillito, 2002), mental time-travel (Raby, Alexis, Dickinson, & Clayton,
55 2007), and a wide range of emotional experiences, including joy and grief (de Waal, 2019);
56 reports of complex forms of consciousness such as empathy (de Waal & Preston, 2017), and of
57 social intelligence such as the formation of reciprocal alliances and the active management of
58 long-term social relationships (Cheney & Seyfarth, 2007), systems of conflict resolution (Aureli
59 & de Waal, 2000), and the ability to impute mental states to others (Call & Tomasello, 2008),
60 including the strategic adjustment of one’s own knowledge of what others know (Emery &
61 Clayton, 2001). These findings have all blurred traditional divisions structuring historical
62 discussions of human uniqueness—including the opposition between nature and culture, between
63 animal objects and human subjects, and between instinctive and rational actions—consequently
64 casting doubt on the anthropocentrism that has largely dominated the history of ethics as a field
65 of philosophical inquiry.

66 Alternative systems of ethical values developed in contemporary animal ethics often rely
67 on empirical evidence to demonstrate the possession (or lack thereof) by a non-human individual
68 of the relevant attribute conferring moral consideration (Allen, 2006). The main theories in
69 animal ethics are pathocentric (i.e., centered on sentience and the capacity to suffer) and
70 therefore hinge on empirical knowledge documenting the sentience of animals—such as recent
71 work demonstrating that fish feel pain (Brown, 2015). In addition, perceptions of animals as
72 “subjects-of-a-life” are central to the deontological approach to animal ethics developed by Tom
73 Regan that has also formed a critical part of the legal case for animal rights (Regan, 1983).

74 Studies revealing the existence of personalities (Sih, Bell, & Johnson, 2004), episodic memory
75 (Clayton, Griffiths, Emery, & Dickinson, 2001), intentionality (Allen & Bekoff, 1995), and
76 rationality (Hurley & Nudds, 2006) have thus been instrumental in revealing that animals have a
77 subjective life, personal history, interests, and goal-oriented agency (Jones, 2013). Taken
78 together, this constellation of results from scientific research on animals has paved the way to
79 changed (and changing) perspectives on the moral status of animals.

80 Despite these critical contributions to animal ethics, animal behavior sciences like
81 ethology, behavioral ecology, and comparative psychology have played a rather passive role in
82 the progression and expansion of this movement. In other words, though animal behavior
83 scientists' work has been integral, it is non-scientists who have primarily pioneered the
84 integration of science and ethics. Here, we advance the argument that if the ethics of human-
85 animal relationships are to be redefined, then more active participation on the part of animal
86 behavior scientists has great potential—not just for moving animal ethics debates forward, but
87 for scientists themselves. To be clear, in attempting to bridge the study of animal behavior and
88 animal ethics, we are not just referring to the ethics of using animals in behavioral sciences—
89 which have already been the focus of thorough reviews (see Text Box 1). Further, although the
90 scientific literature has recently highlighted how animal behavioral sciences can inform animal
91 conservation (e.g., Caro, 2007; Greggor et al., 2016) and animal welfare science (e.g., Dawkins,
92 2006; Fraser, 1999), it has not yet extended to engage with the full realm of issues debated in
93 animal ethics, which include questions about the fundamental ground of moral status. Our
94 primary purpose in this article is to make that extension by addressing three key questions: What
95 are the primary reasons for a gap between animal behavior science and animal ethics? Should
96 behavioral scientists feel concerned about this growing disconnect? And how could they more
97 actively contribute to the development of animal ethics?

98

99 **Why the gap?**

100 A primary reason for a frequent lack of communication between animal ethicists and behavioral
101 scientists may reflect traditional difficulties in crossing disciplinary boundaries. Contemporary
102 scientific culture remains largely disconnected from philosophy, which—unfortunately in our
103 view—is not part of the regular academic training received by scientists; as a result, scientists
104 may not be motivated or prepared to engage in broad ethical discussions that directly pertain to

105 their scientific practice or results. The persistence of a gap is exacerbated institutionally by a lack
106 of educational and career development opportunities that cross-over between behavioral science
107 and philosophy. But it is also caused by fundamentally different theoretical and methodological
108 orientations. Science aims to discover causal relationships between states of affairs and
109 phenomena in the physical world, while ethics is an explicitly value-laden, normative field of
110 inquiry that aims to defend our best judgments as to what we ought to do. We are not here
111 proposing a solution to the “fact/value” relationship or to the problem of whether there are
112 normative facts and how they might “fit” into nature, but rather proposing that differences in the
113 basic questions and methods of scientists and ethicists underlie a prevalent, but divisive attitude
114 that science is rigorous and “objective” while ethical theorizing is more “subjective.”
115 Acquainting scientists with rigorous debate in normative ethics and ethical theory, as well as
116 pointing them to the ways in which scientific research can be enmeshed within the values of the
117 particular times and places in which it is carried out (Kincaid, Dupré, & Wylie, 2007), may help
118 emphasize the benefits of interdisciplinary dialogue and research into the complex historical and
119 logical relationship between science and ethics. Greater awareness of the various conceptual and
120 normative assumptions that may come along with different conceptual frameworks can only
121 improve the quality of scientific thinking (Laplaine et al., 2019).

122 While scientists should all be aware of the spectrum of ethical discussions related to their
123 daily scientific practice, they may sometimes fail to see that animal ethics is a broad and fast-
124 growing area of philosophical inquiry and normative debate concerning the nature of human-
125 animal relationships that is built on rational argumentation. It is important to realize that
126 philosophers working on animal ethics may adopt a diversity of nuanced positions, and do not
127 uniformly defend specific political or policy agendas. Scientists may sometimes lump the term
128 “animal ethics” with other domains, in particular with the set of ethical regulations that rule their
129 research activities (Text Box 1); with the emergence of animal welfare or conservation as
130 scientific fields using research to assess and improve the animal condition; or even with the
131 activism incited by animal rights associations. Conversely, while ethicists may be more aware of
132 scientists’ work than the reverse, they may not be up-to-date with the most current research and
133 debates in the field. Nor do ethicists necessarily have experience rigorously observing animal
134 behavior. Disciplinary segregations between animal welfare scientists, conservation biologists,
135 and (some) animal ethicists are particularly telling examples of the oddity that the divide

136 between these so-called “two cultures” persists even in the context of obviously shared ethical
137 concerns (Fraser, 1999). While the integration of normative and empirical approaches to animal
138 welfare and conservation sciences have eventually gained advocates (i.e., welfare: Dawkins,
139 2006; Fraser, 1999; Würbel, 2009; conservation: Ramp & Bekoff, 2015), scientific discussions
140 of ethical issues have focused on a rather specific set of questions with limited attention to
141 foundational reflection on ethical frameworks and on how normative and empirical approaches
142 relate (Dawkins, 2006).

143 The gap between ethicists and behavioral scientists has further been maintained by
144 mutual defiance and skepticism. If and how animals should be used in science has been a core
145 question of animal ethics since its inception, and behavioral research has immediately been the
146 focus of severe criticism for conducting painful and unnecessary experiments (Ryder, 1975;
147 Singer, 1975). Ethicists subsequently became suspicious towards, or dismissive of, any scientific
148 procedure involving animals to study their behavior (Fraser, 1999). Meanwhile, animal behavior
149 scientists naturally feared condemnation surrounding their research, and may have perceived the
150 gradual development of ethical regulations on the use of animals in research (Text Box 1) as an
151 extra source of constraints and bureaucracy in their work. This divide has likely been furthered
152 by several aspects of the predominant disciplinary culture of animal behavior. Many animal
153 behavior researchers have traditionally adopted the attitude of stifling empathy towards their
154 study subjects in the interest of preserving scientific objectivity and avoiding behavioral
155 interferences with the study subject (Kennedy, 1992). Such detachment in the name of
156 objectivity may have contributed to the notion that an ethical sensibility towards subjects of
157 research is “unscientific” and “subjective,” and may still prevent many researchers from
158 perceiving open engagement with current debates in animal ethics as an integral part of, or at
159 least as compatible with, scientific thinking and practice.

160 New points of tension have arisen in the course of contemporary discussions in animal
161 ethics, which have for the most part been dominated by two competing approaches: utilitarian
162 welfare-based and deontological rights-based approaches. Whereas both approaches share the
163 idea that animal welfare is worthy of protection for its own sake and not for the sake of humans,
164 the welfare approach insists that moral duties related to the humane treatment of animals come
165 from animals’ capacity to feel pain and pleasure. It stems from a utilitarian and consequentialist
166 approach to animal ethics, according to which the aggregate benefits of any intervention into

167 animal lives must exceed any harmful costs (Singer, 1975). In contrast, theories of animal rights
168 are based in deontological ethics, pursuant to which duties to animals come from the respect that
169 they deserve as agents with their own unique interests, aims, and goals. Theorists in this school
170 consider animals' lives to be intrinsically valuable and propose to grant them basic rights—such
171 as the right to life, freedom, and not to be tortured—to prevent them from being treated as “mere
172 means” such that their interests are sacrificed to human interests (Donaldson & Kymlicka, 2011;
173 Francione, 1995; Regan, 1983). This generates a critical tension with welfare approaches,
174 according to which animals retain an instrumental value in situations in which benefits (to the
175 human community) might outweigh harm (to the animals). It is clear that when animal scientists
176 do engage with ethical debates, the prevailing utilitarian, welfare-based approach is often
177 adopted by default, probably due—at least in part—to the use of animals in scientific research.
178 However, many ethicists have instead favored theories of animal rights (Donaldson & Kymlicka,
179 2011), though they have not uniformly condemned the use of animals in research within this
180 framework. Thus, although the practical implications of such divergences in underlying ethical
181 theory may be profound, rights-based theories do not necessarily exclude the possibility of
182 research on animals. For example, just as human volunteers can participate in scientific
183 experiments, it may be possible to envision a research protocol that respects the dissent of a non-
184 human subject (e.g., Fenton, 2014), especially in behavioral research where experiments can be
185 designed in which animals are free to participate.

186

187 **Should animal behavior scientists concern themselves with animal ethics?**

188 A greater integration between animal ethics and the animal behavior scientific community is
189 desirable for ethical and pragmatic reasons. Foremost, there is an ethical reason in that scientists
190 fulfill a social responsibility when they engage with and help others understand ethical
191 implications of research. Yet there are also pragmatic benefits for science, including helping
192 scientists examine sources of historical and cultural bias that may limit scientific questions and
193 approaches, and so further enrich and broaden scientific understanding. Some of these benefits
194 may admittedly arise from interactions with philosophical discussions about the nature of
195 animals that are broader than animal ethics, for example philosophical work on animal minds,
196 perception and representation, social learning and culture, altruism and cooperation, and
197 rationality (Andrews, 2015; Andrews & Beck, 2018). Nonetheless, the recent renewal of the

198 philosophy of animals as a sub-field within the philosophy of science has played and continues
199 to play a major role in the expansion of animal ethics insofar as it has also challenged
200 anthropocentric approaches that have dominated classical philosophy. While the recognition of
201 animal consciousness and subjectivity is growing, it is not unanimous in philosophy (*cf*
202 Carruthers, 2000 and Tye, 2016, for instance). These important debates that are relevant to
203 animal ethics, but are also broader, draw on and require science and should, therefore, be
204 inspiring to animal scientists as well.

205

206 *Filling our social responsibility.* Many scientists are naturally interested in how their results
207 inform and inspire societal debates—one obvious reason for animal behavioral scientists to
208 engage with the literature on animal ethics. In addition to this natural curiosity, and despite
209 commonly holding the view that scientific findings have no intrinsic normative value, scientists
210 still usually support ideas of moral progress that follow from scientific progress in our rational
211 understanding of the natural world. For example, where progress in understanding the neurologic
212 development of infants uncovered the capacity for pain (Anand & Hickey, 1987), it became an
213 ethical duty for scientists to advocate against neonatal surgeries without anesthesia. The parallels
214 to our understanding of animal pain are obvious, and scientists could play an important role in
215 advocating against farming or research practices that involve suffering in the form of pain as
216 well. More generally, ethics makes a claim on scientists to engage with public debates on ethical
217 issues that are related to their scientific activities (and sometimes even raised by their results)
218 (Pain, 2013; Siekevitz, 1970). At a time when researchers in science and technology are often
219 consulted to set the direction and values of society, and often occupy leadership roles on
220 decision-making bodies, this obligation must increasingly be emphasized. For example, a
221 communication from Mark S. Frankel, director of the Scientific Responsibility, Human Rights,
222 and Law Program at the American Association for the Advancement of Science (AAAS), argues
223 that students and scientists should put less emphasis on their internal responsibility regarding
224 how research should be conducted, and more on their external responsibility by being “vitality
225 concerned” with the influence that their work and knowledge can have on society (Pain, 2013).
226 Scientists are increasingly required to justify the benefits of their research to society—this is
227 notably the case for individual applications to research positions or funding, as well as for
228 research evaluations at the institutional level—and growing debates on animal moral status spark

229 public interest in animal behavior science. In this context, active engagement with animal ethics
230 could translate to a new and promising applied dimension of scientists' work—one that is both
231 instrumentally beneficial and aligned with social responsibilities.

232

233 *Opening the “black box” of animal minds.* Following the vast accumulation of knowledge on
234 animal behavior, scientists are faced with new questions about the nature of animal minds, a
235 crucial topic also at the center of philosophical debate today (Andrews, 2015; Andrews & Beck,
236 2018; Lurz, 2009). Nonetheless, the lingering conviction that animal mental states are
237 unknowable—a “black box” that is inaccessible to science—or irrelevant to the explanation of
238 behavior (e.g., Dawkins, 2015) has limited scientifically-informed ethical reasoning about
239 animals. For example, Griffin's (1998) call to bring the study of consciousness to the fore of
240 ethology nearly two decades ago is continually met with considerable resistance (for a historical
241 overview on cognitive ethology, see: Allen & Bekoff, 2007), and some contemporary scientists
242 deny that documenting the degree of animal consciousness is useful in the science of
243 comparative cognition (Shettleworth, 2010). In addition to this fundamental debate on whether
244 animal consciousness can and should be studied by scientists, some major explanatory
245 frameworks in animal behavior science have downplayed the explanatory significance of animal
246 mental and emotional lives. In particular, behavioral ecologists are traditionally trained to focus
247 on the adaptive value of a trait, favoring ultimate over proximate explanations for behavior. As
248 one example, infanticide is often framed exclusively in terms of evolutionary costs/benefits,
249 rather than any underlying emotion or proximate motivation (e.g., see van Schaik & Janson,
250 2009). Although these functional evolutionary explanations are valuable in their own right, they
251 offer only a very limited view of animal emotions, capabilities, and agency, and little to no
252 insight into perceptions, intentionality, rationality, or consciousness residing “inside” of animal
253 minds. This poses a deeper, more fundamental epistemological problem in the sense that
254 building a whole field of scientific inquiry around what is currently a “black box” inherently
255 hampers ultimate explanatory and predictive efforts. This shortcoming in turn reveals how
256 explanatory frameworks in the behavioral sciences can quickly overlook or render invisible the
257 very “object” of moral concern—the organism itself as a potentially sentient entity that can be
258 benefited or harmed—or, at the very least, relegate the organism to secondary status (Walsh,
259 2015).

260 The language that animal behavior scientists habitually employ reflects this deeply
261 entrenched practice (Crist, 1999). Reducing animal behavior to mechanistic, causal descriptions
262 has reinforced the view of animals as “mere” objects or “vehicles” of their genes and
263 environment, preempting any inferences to their mental life or agency (it is noteworthy that in
264 the writings of early naturalists such as Darwin, animals were commonly portrayed as
265 individuals with an array of meaningful subjective experiences and aims). For example, scientists
266 have traditionally used terms such as “innate releasing mechanism” while habitually relegating
267 complex behavioral phenomena—usually those linked with cognitive or affective capacities—to
268 more “parsimonious” explanations, further distancing themselves from the animals they study.
269 However, this presupposes that such technical, parsimonious descriptions are also unbiased, and
270 it would behoove scientists to realize that the theoretical language they employ is built on an
271 inherently skeptical bias towards animal subjective and agential traits. The animal ethics
272 literature, which puts animal subjectivity and agency at the heart of its argumentation, places an
273 ethical urgency and burden of proof on mechanistic views of animal behavior in the behavioral
274 sciences to show that animals are *not* sentient (Birch, 2017, 2018), and to develop more solid
275 inferences about the existence and character of animal subjectivity (e.g., see Godfrey-Smith,
276 2016; Smuts, 2001).

277
278 *Questioning the anthropocentric legacy of behavioral studies.* The slow development of
279 cognitive ethology is not merely a consequence of empirical limitations in accessing animal
280 minds or a predominant focus on ultimate explanation in studies of animal behavior. The
281 avoidance of attributing—or even studying—morally-relevant traits like agency, interests, or
282 motivations and goals to non-human animals reflects a more pervasive bias, namely the
283 perceived dangers of anthropomorphism (e.g., Wynne, 2004). In addition to shaping research
284 questions, experimental settings and interpretations of results traditionally tend to disfavor
285 anthropomorphic hypotheses, according to which similar mechanisms underlie the behavioral
286 similarities observed between humans and non-humans. This occurs even when studying species
287 that are closely related to us, a revelatory context regarding such a bias, referred to as
288 “anthropodenial” by de Waal (1999). According to basic evolutionary principles, the most
289 parsimonious explanation in such cases is the one assuming that similar processes in closely
290 related species emerge from common ancestry (“phylogenetic parsimony”). A scenario in which

291 the evolution of distinct cognitive processes generates similar behavioral manifestations in
292 closely related species is, in fact, improbable. It is also revealing to note that simple mechanistic
293 explanations are generally favored over phylogenetic parsimony when discussing cognitive
294 capacities, as opposed to physiological or anatomical traits, for which scientists have no problem
295 invoking human-animal similarity (de Waal, 1999). This bias appears to be a direct, pervasive
296 legacy of the famous Morgan's Canon proposed at the end of the 19th century, which states that:
297 *'In no case may we interpret an action as the outcome of the exercise of a higher psychical*
298 *faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the*
299 *psychological scale'* (Morgan, 1894, p. 53). A large philosophical literature has recently
300 accumulated around related methodological issues (Buckner, 2017; Fitzpatrick, 2008; Halina,
301 2015; Keeley, 2004; Mikhalevich, 2014; Sober, 2012), and scientists can benefit from deeper
302 reflection on any bias toward simplicity that is motivated by worries about the dangers of
303 anthropomorphism.

304 Another upshot of this approach is that the threshold of evidence needed to provide
305 support for a particular cognitive or emotional faculty in other species is much higher than in our
306 own. For example, the definition of animal teaching initially proposed by Caro and Hauser
307 (1992) has proven so strict that it would exclude many occurrences of human teaching as
308 employed in common parlance (Laland & Hoppitt, 2003). This anthropocentric perspective has
309 also figured prominently in debates about animal emotions (Bekoff, 2009; de Waal, 2019); it is
310 not just a remnant of the behaviorist era but still alive today in the form of categorical rejections
311 of anthropomorphism and anecdote. However, when the animal's perspective is carefully
312 considered, anthropomorphic and anecdotal accounts have an important role to play in informing
313 and inspiring rigorous science (Bates & Byrne, 2007; Burghardt, 1991; de Waal, 1999; Godfrey-
314 Smith, 2016), particularly when it comes to animal mental capacities and emotions (Bekoff,
315 2009). While this form of anthropocentric reductionism is very entrenched in the Western
316 scientific culture in animal behavior, an independent academic tradition emerged in Japan, where
317 anecdotes were valued, and where anthropomorphism was not considered a threat (Asquith,
318 1996; de Waal, 2003). Despite intense criticisms by Western scientists, Japanese primatologists
319 used individually-based observations—which are now the standard in ethological studies—and
320 made fundamental discoveries in socio-ecology, such as the existence of tight family bonds
321 structuring animal societies, and the diffusion of socially-learned behaviors throughout animal

322 groups, long before these questions crystallized interest in Western research (Asquith, 1996; de
323 Waal, 2003). This example illustrates the potential benefits of raising scientists' awareness of the
324 cultural and cognitive biases that may hamper progress in their discipline. And even though the
325 fear of anthropomorphism may be less present in today's scientific culture than it used to be, the
326 critical stance adopted by thinkers in animal ethics regarding anthropocentric values, combined
327 with their fresh and attentive eye towards animal minds and subjectivity, encourages behavioral
328 scientists who have not already done so to inspect the deeply entrenched sources of biases that
329 inevitably affect their discipline.

330

331 *Enriching scientific practices.* A greater consideration of animal interests and subjectivity may
332 be beneficial pragmatically by changing the way scientists ask questions, design protocols, and
333 interpret animal reactions to experimental conditions. Integrating information about the first-
334 person perspective of the animal is increasingly recognized as important in evolutionary
335 modelling of the effects of natural selection on behavior (e.g., Akçay, Van Cleve, Feldman, &
336 Roughgarden, 2009). When designing experiments, careful attention to the animal's perspective
337 on a proposed task can reduce some biases—such as experimenter effects (Despret, 2015). For
338 example, laboratory mice perceive gender of the experimenter and may consequently modify
339 their behavioral response in an experiment, with male experimenters eliciting a greater stress
340 response than females (Sorge et al., 2014). Along similar lines, earlier scholars appreciated that
341 animals live in meaningful and complex worlds, and that adopting the animal's sensory
342 perspective was a necessary precondition for the successful study of behavior (von Uexküll,
343 1992/1957). In contrast, subsequent behavioral studies have sometimes failed to adopt such a
344 perspective by designing studies linked to species-specific daily environmental challenges, and
345 so are at risk of making erroneous inferences about animal capacities. For example, dogs were
346 once thought to lack self-awareness due to their failure to pass the mirror self-recognition task,
347 which is strongly biased towards visual species, but they were subsequently found to succeed in
348 passing an “olfactory mirror” test (e.g., Gatti, 2016). The role of perspective-taking in animal
349 behavior research is also central to the influential work of philosopher Merleau-Ponty (1998),
350 who first established a link between animal behavior and phenomenology—which can arguably
351 make a major contribution to both animal ethics (Painter & Lotz, 2007) and scientific research on
352 animal behavior (Ruonakoski, 2007) by offering additional insights into animal subjectivity.

353 When it comes to studying animal behavior, Merleau-Ponty (1998) questions the behaviorist way
354 of interpreting the scientist's role, requiring the scientist's detachment from the study subject.
355 Rather than rejecting anthropomorphism and denying their own sensitivity towards the behavior
356 of study subjects, scientists could acknowledge that human experience, careful observation, and
357 even engaged interaction with animals are the only possible starting points for their
358 investigations, because absolute detachment is impossible in practice (e.g., see Candea, 2010;
359 Ruonakoski, 2007; Smuts, 2001).

360 An interdisciplinary dialogue between philosophers, ethicists, and scientists may promote
361 changes in paradigms that could usefully complement traditional approaches and open
362 productive, more holistic avenues to study and understand animal behavior without
363 compromising scientific rigor. In particular, research in cognitive ethology on concepts rooted in
364 classical, anthropocentric philosophy (e.g., self-awareness, empathy, free will, or culture) would
365 benefit from such discussions, which may facilitate the establishment of more inclusive
366 definitions (i.e., applicable to studying non-human animals) that retain theoretical and empirical
367 traction. It would further encourage reflection on the most efficient research approaches and the
368 criteria that would provide supporting evidence for the existence of such phenomena in other
369 species. As one example, some philosophers reexamined the state of knowledge regarding
370 behaviors long thought to be human-unique, such as the capacity to commit suicide (e.g., Peña-
371 Guzmán, 2017), by lending more weight to animal subjectivity than many scientists traditionally
372 have. These exercises illustrate the potential power of such interdisciplinary dialogues for
373 enriching the perspectives of scientists working on animal behavior, while making them more
374 aware of the fact that a collection of scientific observations can lead to divergent interpretative
375 frameworks.

376 In sum, interactions between the science of animal behavior and animal ethics could have
377 a greater and mutually beneficial scope, addressing questions about what animals are, how we
378 should treat them, and how to envision potential futures for human-animal interactions. The
379 possibility of such a productive exchange between science and philosophy has a strong precedent
380 in the relationship between the science of ecology and environmental philosophy. By generating
381 new scientific knowledge on the interconnectedness and dependence amongst various forms of
382 life, the field of ecology has also influenced ethical thought. Though not uniformly defended by
383 ethicists, ecology has led to calls to regard supra-individual processes, such as ecosystems

384 themselves, as intrinsically valuable and as objects of ethical concern—particularly concerning
385 planetary health criteria grounded in the capacity to sustain and generate biodiversity. Just as in
386 the case of animal behavior science and animal ethics, ecology too has been a source for
387 combating anthropocentrism and generating a more balanced, indeed scientifically informed,
388 worldview regarding the place of humans as one species embedded within deeply
389 interconnected, interdependent living systems (Callicott, 1990).

390

391 **How can animal behavior scientists engage with philosophy and animal ethics?**

392 In turn, animal behavior scientists can contribute to animal ethics in various ways. Their
393 potential contributions to animal ethics span the full spectrum of scientific activities—not only in
394 offering original evidence that fuels theoretical progress in animal ethics, but shaping its
395 practical applications, lending pertinent expertise, and communicating effectively with the wider
396 public. There are, however, boundary conditions to what they can offer to ethicists; one
397 prerequisite is that some research involving animals is tolerated—itsself a source of disagreement
398 even within the animal ethics community—provided that its costs are minimal and outweighed
399 by clear benefits. As a result, behavioral scientists should carefully take ethical considerations
400 into account when designing their research (Text Box 1).

401 *Foster productive interdisciplinary exchanges.* An essential first step in this integration could be
402 for behavioral scientists to familiarize themselves with the field of animal ethics (Armstrong &
403 Botzler, 2017 provide a comprehensive anthology of readings on animal ethics), which will also
404 cultivate mutual respect and awareness across fields. However, at least to our knowledge, animal
405 ethics, and philosophy more generally, are often absent from animal behavior educational
406 programs and curricula. Reciprocally, academic departments in animal studies are typically
407 housed in social science or humanities faculties, and often lack scientists. This structural
408 separation limits cross-disciplinary exchanges, which could be encouraged by the development
409 of joint teaching, reading groups, research programs, and conferences. Mutual engagement and
410 integrative theory-building could be further fostered by hosting philosophers and ethicists in
411 scientific labs and research groups. Further, several interdisciplinary journals now provide a
412 forum wherein scholars across these disparate fields can comment on topics of mutual interest

413 ranging from animal emotions to the most sound approaches to animal protection legislation
414 (e.g., see Birch, 2017 along with associated commentaries).

415 Upon gaining meaningful exposure to the basic purview of animal ethics, scientists of
416 animal behavior can further update some of their conceptual frameworks and research practices
417 (as elaborated in the previous section), which may simultaneously foster the endorsement of their
418 findings by non-scientists pursuing related questions. Among the most notable successes in this
419 regard is pioneering work in the area of compassionate conservation, which attempts to appease
420 tensions between scientists who conventionally focus on species and populations and ethicists
421 who typically focus on individuals (Ramp & Bekoff, 2015).

422

423 *Produce relevant original evidence.* As highlighted above, original evidence stemming from the
424 natural course of animal behavior science has already played a role in inspiring important
425 developments in animal philosophy. Of course, while detailed knowledge concerning the
426 cognitive, affective, and social lives of animals can contribute to our understanding of what is
427 “painful” to an animal, its degree of sentience and consciousness, the optimal environments in
428 which it thrives, etc., it certainly cannot tell us what is right or wrong—the central concepts that
429 structure ethical theory and practice. Nevertheless, biological knowledge on the natural behavior
430 of different species, in relation to their phylogenetic position and ecology, can help in setting
431 species-specific criteria for animal ethics agendas. It also has a hand in proposing modes of
432 interactions with animals that are respectful of their physiology and psychology, consistent with
433 a new theory of animal rights that borrows concepts from political philosophy (including
434 citizenship or sovereignty) to envision a new legal frame applicable to the complexity and
435 diversity of animal-human relationships (Donaldson & Kymlicka, 2011).

436 In addition, as has already occurred in conservation practice, there is growing pressure
437 for policy decisions concerning animal ethics to be evidence-based, and animal behavior
438 scientists are positioned to contribute data and knowledge that can, at a minimum, inform
439 political decisions regarding the assignment of diverse taxonomic groupings to particular moral
440 categories (Jones, 2013). The diversity of species that animal behavior scientists study—many of
441 which are beneath the radar of philosophers in favor of a focus on higher vertebrates (with
442 notable exceptions, e.g., Godfrey-Smith, 2016; Tye, 2016)—can raise new ethical concerns and
443 priorities. For example, combined with novel insights on behavioral and cognitive complexity,

444 accumulating scientific evidence that fish feel pain has supported the argument that they be
445 granted similar legal protections to other vertebrates (Brown, 2015). Similarly, legal personhood
446 campaigns, generally devised to grant legal protections to large mammals, are contingent on
447 evidence concerning capacities like self-awareness and autonomy (Andrews et al., 2018; Wise,
448 2000). Thompson (2019) recently outlined how scientists' work could better position lawyers to
449 build personhood cases, citing four domains—innovativeness, altruism, self-control, and
450 defiance—that would more demonstrably provide evidence for autonomy to the court system.
451 Despite philosophical disagreement over the personhood defense of animal rights (e.g., see
452 Korsgaard, 2018; Nussbaum, 2018), such communications are important given that scientists do
453 not naturally design their research in light of legal principles and questions.

454 The need for evidence-based animal ethics frameworks is not to overlook the veritable
455 limits of scientific knowledge. It is important to note that the pace and reach of scientific
456 progress is not always compatible with more immediate ethical decisions, necessitating guidance
457 on what to do in the absence of convincing scientific evidence for aspects of animal sentience
458 (e.g., see Birch, 2017). Further, burden of proof frameworks must weigh the relative
459 consequences of under- versus over-attributing particular mental states to animals, as such
460 estimations can immediately impact welfare and related policy decisions—in particular, the
461 implications of our systematic use of skepticism as the default position should be carefully
462 evaluated (Birch, 2017, 2018). It is also important to acknowledge the diversity of ethical stances
463 towards the weight of scientific evidence—not merely in terms of what is accepted/tolerated, but
464 what is encouraged as the optimal way to understand the complexity of the world around us.
465 There are important philosophical discussions about the sources of our judgment as to whether or
466 not animals have minds and mental lives, with some defending non-inferential approaches based
467 on direct experience (see Jamieson, 2012; see also Bekoff, 2009 for an interesting discussion of
468 scientific vs. common-sense approaches, which are likely best considered in tandem when it
469 comes to animal ethics).

470 Regardless of one's position here, many scientists in the field of animal behavior spend
471 considerable time observing animals, and thus have a wealth of direct “real world” experiences
472 in this regard. A deep understanding of evolutionary theory, allied with the intimate experiences
473 that people who work extensively with animals have, can translate to a unique perspective on
474 animals and human-animal relationships that ethical debate should capitalize on (see Godfrey-

475 Smith, 2016; Smuts, 2001 for pertinent examples). Phenomenologists are particularly interested
476 in such perspectives given their potential to elucidate new realms of being and experience,
477 challenging traditional philosophical views on animal natures and intersubjectivity (Merleau-
478 Ponty, 1998).

479
480 *Provide scientific expertise.* Scientists' ability to synthesize and scrutinize academic knowledge
481 has the potential to further guide the public and policymakers in their interpretation of scientific
482 evidence. For example, The Cambridge Declaration on Consciousness (Low et al., 2012)—
483 prompted by the accumulation of data revealing that humans are not unique in possessing the
484 neurological substrates that generate consciousness—was written by a group of neuroscientists to
485 challenge previously held standards. Animal behavior scientists could similarly consider
486 synthesizing information about species' intellectual, emotional, and social lives in a format that
487 can be used by decision-makers when drafting and/or updating ethics policies and legislation,
488 preferably through quantitative meta-analyses and systematic reviews. Conservation and animal
489 behavior scientists recently convened to identify research priorities in animal behavior that
490 promote progress in applied conservation (Greggor et al., 2016); a similar exercise could benefit
491 the translation of animal ethics into practical actions. Court cases on animal legal personhood are
492 arising in a growing number of countries, providing a new context where animal behavior
493 scientists may be expected to act as experts. However, unlike scientists who regularly intervene
494 in court cases and are well aware of the legal culture, such as criminologists or psychiatrists,
495 animal behavioral scientists are generally unprepared for such an exercise. At a smaller scale
496 (and if not already the case), behavioral scientists can join ethics committees to ensure
497 independent representation of animal interests in other scientific fields, and ascertain that ethical
498 concerns are carefully weighed when reviewing articles and grant applications in their own field.

499
500 *Add a scientific credit to animal ethics in outreach efforts.* Finally, scientists are often perceived
501 as the authorities on animal behavior, and therefore have the opportunity to inform and engage
502 the public about animal interests. Yet while it is commonplace for animal behavior scientists to
503 emphasize the conservation implications of their work, other broader impacts related to the moral
504 standing of animals are emphasized relatively less in their public outreach. Increasingly, research
505 on animal behavior has mass public appeal, which opens the door for animal behavior scientists

506 to more actively engage with contemporary animal ethical or philosophical debates and
507 discussions—following the recent tracks of some behavioral scientists (Balcombe, 2006; Bekoff,
508 2009; Brown, 2015; Smuts, 2001).

509

510 **Concluding remarks**

511 Animal behavioral scientists have much to gain from their academic community's engagement
512 with animal ethics. By jumping into the discussion, scientists also engage more directly with a
513 revolution that has been in part stimulated by their work. Given the rapid rise and foreseeable
514 progress of debates around animal ethics, it is certain that the current generation of animal
515 behavior scientists will have to confront the questions that it raises in the coming decade(s), both
516 as scientists and as citizens. Developing a stronger, more informed and engaged stance that aims
517 to build consensus surrounding questions raised in animal ethics becomes critical to ensure the
518 long-term importance and contribution of their scientific field, to fulfill their moral obligations,
519 and to meet societal expectations by taking part in debates that they are well-positioned to
520 inform. We hope that this paper will encourage this pressing and overdue discussion.

521

522 **Acknowledgments**

523 We would like to extend our thanks to many colleagues for insightful comments at various stages
524 of this manuscript's preparation, especially: Alice Baniel, Alecia Carter, Marie Charpentier,
525 Becca Franks, Jennifer Jacquet, Alex Lee, and Harry Marshall. We are further grateful to several
526 anonymous reviewers, who provided thorough and constructive feedback, as well as Marc
527 Bekoff for his advice and encouragement. Finally, we would like to express our gratitude to the
528 non-human animals with whom we have worked over the years. Those experiences inspired this
529 paper and most importantly, cultivated a personal and professional concern for animal ethics.

530 **References**

- 531 Akçay, E., Van Cleve, J., Feldman, M. W., & Roughgarden, J. (2009). A theory for the evolution
532 of other-regard integrating proximate and ultimate perspectives. *Proceedings of the*
533 *National Academy of Sciences*, 106(45), 19061–19066.
- 534 Allen, C. (2006). Ethics and the science of animal minds. *Theoretical Medicine and Bioethics*,
535 27(4), 375–394.
- 536 Allen, C., & Bekoff, M. (1995). Cognitive ethology and the intentionality of animal behaviour.
537 *Mind and Language*, 10(4), 313–328.
- 538 Allen, C., & Bekoff, M. (2007). Animal minds, cognitive ethology, and ethics. *The Journal of*
539 *Ethics*, 11(3), 299–317.
- 540 Anand, K. J. S., & Hickey, P. R. (1987). Pain and its effects in the human neonate and fetus. *The*
541 *New England Journal of Medicine*, 317, 1321–1329.
- 542 Andrews, K. (2015). *The Animal Mind: An Introduction to the Philosophy of Animal Cognition*.
543 New York, NY: Routledge/Taylor & Francis Group.
- 544 Andrews, K., & Beck, J. (Eds.). (2018). *The Routledge Handbook of Philosophy of Animal*
545 *Minds*. New York, NY: Routledge.
- 546 Andrews, K., Comstock, G., Donaldson, S., John, T. M., Johnson, L. S. M., Jones, R. C., ...
547 Sebo, J. (2018). *Chimpanzee Rights: The Philosophers' Brief*. London, UK: Routledge.
- 548 Armstrong, S. J., & Botzler, R. G. (2017). *The Animal Ethics Reader*. (S. J. Armstrong & R. G.
549 Botzler, Eds.) (3rd ed.). New York, NY: Routledge.
- 550 Asquith, P. J. (1996). Japanese science and western hegemonies: Primatology and the limits set
551 to questions. In L. Nader (Ed.), *Naked Science. Anthropological Inquiry into Boundaries,*
552 *Power, and Knowledge* (pp. 239–256). Routledge.
- 553 Association for the Study of Animal Behaviour. (2012). Guidelines for the treatment of animals
554 in behavioural research and teaching. *Animal Behaviour*, 83(1), 301–309.
555 <https://doi.org/10.1016/j.anbehav.2011.10.031>
- 556 Aureli, F., & de Waal, F. B. M. (2000). *Natural Conflict Resolution*. (Filippo Aureli & F. B. M.
557 de Waal, Eds.). Berkeley, CA: University of California Press.
- 558 Balcombe, J. (2006). *Pleasurable Kingdom: Animals and the Nature of Feeling Good*. London,
559 UK: Macmillan.
- 560 Bates, L. A., & Byrne, R. W. (2007). Creative or created : Using anecdotes to investigate animal
561 cognition. *Methods*, 42, 12–21.
- 562 Bekoff, M. (2009). Animal emotions and animal sentience and why they matter: Blending
563 'science sense' with common sense, compassion and heart. In J. D'Silva & J. Turner (Eds.),
564 *Animals, Ethics and Trade*. London, UK: Earthscan Publishing.

- 565 Bekoff, M., & Pierce, J. (2017). *The Animals' Agenda: Freedom, Compassion, and Coexistence*
566 *in the Human Age*. Boston, MA: Beacon Press.
- 567 Birch, J. (2017). Animal sentience and the precautionary principle. *Animal Sentience*, 16, 1–16.
- 568 Birch, J. (2018). Animal cognition and human values. *Philosophy of Science*, 85(5), 1026–1037.
- 569 Brown, C. (2015). Fish intelligence, sentience and ethics. *Animal Cognition*, 18(1), 1–17.
- 570 Buckner, C. (2017). Rational inference: The lowest bounds. *Philosophy and Phenomenological*
571 *Research*. <https://doi.org/10.1111/phpr.12455>
- 572 Burghardt, G. M. (1991). Cognitive ethology and critical anthropomorphism: A snake with two
573 heads and hognose snakes that play dead. In C. A. Ristau (Ed.), *Cognitive ethology: The*
574 *minds of other animals: Essays in honor of Donald R. Griffin* (pp. 53–90). Hillsdale, NJ:
575 Lawrence Erlbaum Associates.
- 576 Call, J., & Tomasello, M. (2008). Does the chimpanzee have a theory of mind? 30 years later.
577 *TRENDS in Cognitive Sciences*, 12(5), 187–192.
- 578 Callicott, J. B. (1990). Whither conservation ethics? *Conservation Biology*, 4, 15–20.
- 579 Candea, M. (2010). I fell in love with carlos the meerkat: Engagement and detachment in human-
580 animal Relations. *American Ethnologist*, 37(2), 241–258.
- 581 Caro, T. (2007). Behavior and conservation: A bridge too far? *TRENDS in Ecology and*
582 *Evolution*, 22(8), 394–400.
- 583 Caro, T., & Hauser, M. D. (1992). Is there teaching in nonhuman animals? *The Quarterly Review*
584 *of Biology*, 67(2), 151–174.
- 585 Carruthers, P. (2000). *Phenomenal Consciousness: A Naturalistic Theory*. Cambridge, UK:
586 Cambridge University Press.
- 587 Ceballos, G., Ehrlich, P. R., Barnosky, A. D., García, A., Pringle, R. M., & Palmer, T. M.
588 (2015). Accelerated modern human-induced species losses: Entering the sixth mass
589 extinction. *Sciences Advances*, 1(e1400253), 1–5.
- 590 Cheney, D. L., & Seyfarth, R. M. (2007). *Baboon Metaphysics - The Evolution of a Social Mind*.
591 Chicago, IL: University of Chicago Press.
- 592 Clayton, N. S., Griffiths, D. P., Emery, N. J., & Dickinson, A. D. (2001). Episodic-like memory
593 in animals. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 356,
594 1483–1491.
- 595 Costello, M. J., Beard, K. H., Corlett, R. T., Cumming, G. S., Devictor, V., Loyola, R., ...
596 Primack, R. B. (2016). Field work ethics in biological research. *Biological Conservation*,
597 203, 268–271.
- 598 Crist, E. (1999). *Images of Animals: Anthropomorphism and Animal Mind*. Philadelphia, PA:
599 Temple University Press.

- 600 Dawkins, M. S. (2006). A user's guide to animal welfare science. *TRENDS in Ecology and*
601 *Evolution*, 21(2), 77–82.
- 602 Dawkins, M. S. (2015). Animal welfare and the paradox of animal consciousness. *Advances in*
603 *the Study of Behavior*, 47, 5–38.
- 604 de Waal, F. B. M. (1999). Anthropomorphism and anthropodenial: Consistency in our thinking
605 about humans and other animals. *Philosophical Topics*, 27(1), 225–280.
- 606 de Waal, F. B. M. (2003). Silent invasion: Imanishi's primatology and cultural bias in science.
607 *Animal Cognition*, 6, 293–299.
- 608 de Waal, F. B. M. (2019). *Mama's Last Hug*. London, UK: Norton.
- 609 de Waal, F. B. M., & Preston, S. D. (2017). Mammalian empathy: Behavioral manifestations and
610 neural basis. *Nature Reviews Neuroscience*, 18, 498–509.
- 611 Despret, V. (2015). Thinking Like a Rat. *Angelaki*, 20(2), 121–134.
- 612 Donaldson, S., & Kymlicka, W. (2011). *Zoopolis: A Political Theory of Animal Rights*. Oxford,
613 UK: Oxford University Press.
- 614 Emery, N. J., & Clayton, N. S. (2001). Effects of experience and social context on prospective
615 caching strategies by scrub jays. *Nature*, 414(6862), 443–446.
- 616 Fenton, A. (2014). Can a chimp say “no”? Reenvisioning chimpanzee dissent in harmful
617 research. *Cambridge Quarterly of Healthcare Ethics*, 23(2), 130–139.
- 618 Field, K. A., Paquet, P. C., Artelle, K., Proulx, G., Brook, R. K., & Darimont, C. T. (2019).
619 Publication reform to safeguard wildlife from researcher harm. *PLoS Biology*, 17(4),
620 e3000193.
- 621 Fitzpatrick, S. (2008). Doing away with Morgan's canon. *Mind and Language*, 23(2), 224–246.
- 622 Francione, G. (1995). *Animals, Property, and The Law*. Philadelphia, PA: Temple University
623 Press.
- 624 Fraser, D. (1999). Animal ethics and animal welfare science: Bridging the two cultures. *Applied*
625 *Animal Behaviour Science*, 65, 171–189.
- 626 Gallup, G. G., Anderson, J. R., & Shillito, D. J. (2002). The mirror test. In Marc Bekoff, C.
627 Allen, & G. M. Burghardt (Eds.), *The Cognitive Animal: Empirical and Theoretical*
628 *Perspectives on Animal Cognition*. (pp. 325–333). Cambridge, MA: MIT Press.
- 629 Gatti, C. R. (2016). Self-consciousness: Beyond the looking-glass and what dogs found there.
630 *Ethology, Ecology & Evolution*, 28(2), 232–240.
- 631 Godfrey-Smith, P. (2016). *Other minds: The octopus, the sea, and the deep origins of*
632 *consciousness*. Farrar, Straus and Giroux.
- 633 Greggor, A. L., Berger-Tal, O., Blumstein, D. T., Angeloni, L., Bessa-Gomes, C., Blackwell, B.

- 634 F., ... Sutherland, W. J. (2016). Research priorities from animal behaviour for maximising
635 conservation progress. *Trends in Ecology and Evolution*, 31(12), 953–964.
- 636 Griffin, D. R. (1998). From cognition to consciousness. *Animal Cognition*, 1(1), 3–16.
- 637 Guidelines for Ethical Conduct in the Care and Use of Nonhuman Animals in Research. (2010).
638 Retrieved from <http://www.apa.org/science/leadership/care/care-animal-guidelines.pdf>
- 639 Halina, M. (2015). There Is no special problem of mindreading in nonhuman animals.
640 *Philosophy of Science*, 82(3), 473–490.
- 641 Hämäläinen, A., Heistermann, M., Fenosoa, Z. S. E., & Kraus, C. (2014). Evaluating capture
642 stress in wild gray mouse lemurs via repeated fecal sampling: Method validation and the
643 influence of prior experience and handling protocols on stress responses. *General and
644 Comparative Endocrinology*, 195, 68–79.
- 645 Harrison, R. (2013). *Animal Machines: The New Factory Farming Industry*. London, UK: J.
646 Harrison & J. Wilson (Original work published in 1957).
- 647 Hurley, S. L., & Nudds, M. (2006). *Rational Animals?* (S. L. Hurley & M. Nudds, Eds.). Oxford,
648 UK: Oxford University Press.
- 649 Jamieson, D. (2002). *Morality's Progress: Essays on Humans, Other Animals, and the Rest of
650 Nature*. New York, NY: Oxford University Press.
- 651 Jamieson, D. (2012). Science, knowledge, and animal minds. *Proceedings of the Aristotelian
652 Society*, 98, 79–102.
- 653 Jones, R. C. (2013). Science, sentience, and animal welfare. *Biology and Philosophy*, 28(1), 1–
654 30.
- 655 Keeley, B. L. (2004). Anthropomorphism, primatomorphism, mammalomorphism:
656 Understanding cross-species comparisons. *Biology and Philosophy*, 19(4), 521–540.
- 657 Kennedy, J. S. (1992). *The New Anthropomorphism*. Cambridge, UK: Cambridge University
658 Press.
- 659 Kincaid, H., Dupré, J., & Wylie, A. (Eds.). (2007). *Value-Free Science?: Ideals and Illusions*.
660 Oxford, UK: Oxford University Press.
- 661 Korsgaard, C. (2018). *Fellow Creatures: Our Obligations to Other Animals*. Oxford University
662 Press.
- 663 Laland, K. N., & Bennett, G. (2009). *The Question of Animal Culture*. Cambridge, MA: Harvard
664 University Press.
- 665 Laland, K. N., & Hoppitt, W. (2003). Do animals have culture? *Evolutionary Anthropology*, 12,
666 150–159.
- 667 Laplane, L., Mantovani, P., Adolphs, R., Chang, H., Mantovani, A., McFall-Ngai, M., ... Pradeu,
668 T. (2019). Opinion: Why science needs philosophy. *Proceedings of the National Academy*

- 669 *of Sciences*, 116(10), 3948–3952.
- 670 Le Maho, Y., Saraux, C., Durant, J. M., Viblanc, V. A., Gauthier-Clerc, M., Yoccoz, N. G., ...
 671 Le Bohec, C. (2011). An ethical issue in biodiversity science: The monitoring of penguins
 672 with flipper bands. *Comptes Rendus Biologies*, 334, 378–384.
- 673 Low, P., Panksepp, J., Reiss, D., Edelman, D., Van Swinderen, B., & Koch, C. (2012). The
 674 Cambridge Declaration on Consciousness. Retrieved from
 675 <http://fcmconference.org/img/CambridgeDeclarationOnConsciousness.pdf>
- 676 Lurz, R. W. (Ed.). (2009). *The Philosophy of Animal Minds*. Cambridge University Press.
- 677 Mackinnon, K. C., & Riley, E. P. (2010). Field primatology of today: Current ethical issues.
 678 *American Journal of Primatology*, 72(9), 749–753.
- 679 Merleau-Ponty, M. (1998). *The Structure of Behavior* (Translatio). Pittsburgh, PA.
- 680 Mikhalevich, I. (2014). A critique of the principle of cognitive simplicity in comparative
 681 cognition. *Biology and Philosophy*, 29(5), 731–745.
- 682 Morgan, C. L. (1894). *An Introduction to Comparative Psychology*. London, UK: W. Scott.
- 683 Nussbaum, M. C. (2018). Working with and for animals: Getting the theoretical framework right.
 684 *Journal of Human Development and Capabilities*, 19(1), 2–18.
- 685 Ouattara, K., Lemasson, A., & Zuberbühler, K. (2009). Campbell’s monkeys concatenate
 686 vocalizations into context-specific call sequences. *Proceedings of the National Academy of
 687 Sciences of the United States of America*, 106(51), 22026–22031.
- 688 Pain, E. (2013). The social responsibilities of scientists.
 689 <https://doi.org/10.1126/science.caredit.a1300016>
- 690 Painter, C., & Lotz, C. (2007). *Phenomenology and the Non-Human Animal: At the Limits of
 691 Experience*. (C. Painter & C. Lotz, Eds.). Dordrecht: Springer.
- 692 Raby, C. R., Alexis, D. M., Dickinson, A., & Clayton, N. S. (2007). Planning for the future by
 693 western scrub-jays. *Nature*, 445, 919–921.
- 694 Rachels, J. (1990). *Created from Animals: The Moral Implications of Darwinism*. Oxford, UK:
 695 Oxford University Press.
- 696 Ramp, D., & Bekoff, M. (2015). Compassion as a practical and evolved ethic for conservation.
 697 *BioScience*, 65(3), 323–327.
- 698 Reader, S. M., Morand-Ferron, J., & Flynn, E. (2016). Animal and human innovation: novel
 699 problems and novel solutions. *Philosophical Transactions of the Royal Society B:
 700 Biological Sciences*, 371(1690).
- 701 Regan, T. (1983). *The Case for Animal Rights*. Berkeley, CA: University of California Press.
- 702 Regan, T., & Singer, P. (1989). *Animal Rights and Human Obligations*. (T. Regan & P. Singer,

- 703 Eds.) (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.
- 704 Rollin, B. E. (1992). *Animal Rights and Human Morality* (revised ed). Buffalo, NY: Prometheus
705 Books.
- 706 Ruonakoski, E. (2007). Phenomenology and the study of animal behavior. In C. Painter & C.
707 Lotz (Eds.), *Phenomenology and the Non-Human Animal: At the Limits of Experience* (pp.
708 75–84). Dordrecht: Springer.
- 709 Ryder, R. D. (1975). *Victims of Science: The Use of Animals in Research*. London, UK: Davis-
710 Poynter Ltd.
- 711 Sanz, C. M., Call, J., & Boesch, C. (2013). *Tool Use in Animals*. (C. M. Sanz, J. Call, & C.
712 Boesch, Eds.). Cambridge, UK: Cambridge University Press.
- 713 Seyfarth, R. M., Cheney, D. L., & Marler, P. (1980). Monkey responses to three different alarm
714 calls: Evidence of predator classification and semantic communication. *Science*, 210(4471),
715 801–803.
- 716 Shettleworth, S. (2010). *Cognition, Evolution, and Behavior* (2nd ed.). Oxford, UK: Oxford
717 University Press.
- 718 Siekevitz, P. (1970). Scientific responsibility. *Nature*, 227, 1301–1303.
- 719 Sih, A., Bell, A., & Johnson, J. C. (2004). Behavioral syndromes: An ecological and
720 evolutionary overview. *TRENDS in Ecology and Evolution*, 19(7), 372–378.
- 721 Singer, P. (1975). *Animal Liberation: A New Ethics for Our Treatment of Animals*. New York,
722 NY: Random House.
- 723 Smuts, B. (2001). Encounters with animal minds. *Journal of Consciousness Studies*, 8(5), 293–
724 309.
- 725 Sober, E. (2012). Anthropomorphism, parsimony, and common Ancestry. *Mind and Language*,
726 27(3), 229–238.
- 727 Sorge, R. E., Martin, L. J., Isbester, K. A., Sotocinal, S. G., Rosen, S., Tuttle, A. H., ... Mogil, J.
728 S. (2014). Olfactory exposure to males, including men, causes stress and related analgesia
729 in rodents. *Nature Methods*, 11, 629–632.
- 730 Thompson, S. (2019). Supporting ape rights: Finding the right fit between science and the law.
731 *ASEBL Journal*, 14(1), 3–24.
- 732 Tye, M. (2016). *Tense Bees and Shell-Shocked Crabs: Are Animals Conscious?* Oxford, UK:
733 Oxford University Press.
- 734 van Schaik, C. P., & Janson, C. H. (Eds.). (2009). *Infanticide by Males and its Implications*.
735 Cambridge University Press.
- 736 von Uexküll, J. (1992). A stroll through the worlds of animals and men: A picture book of
737 invisible worlds. *Semiotica*, 89(4), 319-391 (Original work published in 1957).

- 738 Walsh, D. (2015). *Organisms, Agency, and Evolution*. Cambridge University Press.
- 739 Wise, S. (2000). *Rattling the Cage: Toward Legal Rights for Animals*. Cambridge, MA: Perseus
740 Publishing.
- 741 Würbel, H. (2009). Ethology applied to animal ethics. *Applied Animal Behaviour Science*,
742 *118*(3–4), 118–127.
- 743 Wynne, C. D. L. (2004). The perils of anthropomorphism. *Nature*, *428*, 606.

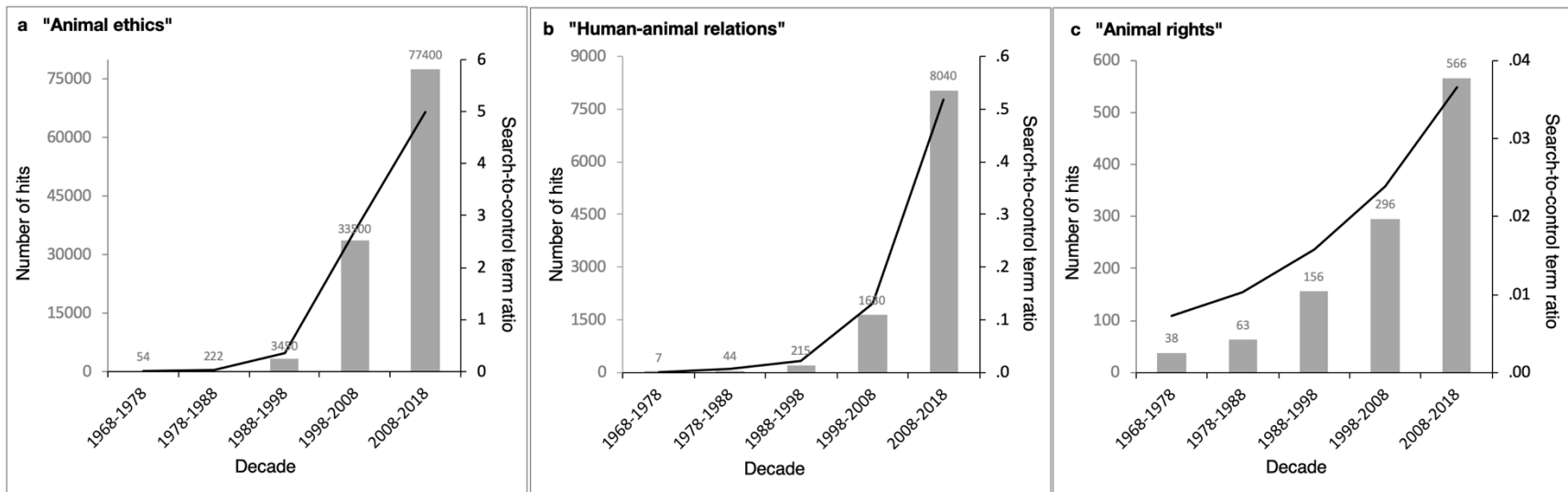


Figure 1. Web-based search results (grey bars correspond to total number of hits) for the search terms (a) “animal ethics” as well as (b) “human-animal relations” in academic articles, and (c) “animal rights” in U.S. state/federal case law. The ratio of the total number of hits for each search term to the total number of hits for the (control) search term “animal” during the same decade is illustrated by black lines (see secondary Y-axis) to account for growth in scientific knowledge over time. All information was obtained from Google Scholar on May 17, 2019.

Text Box 1: The ethics of using animals in behavioral science

In this paper, we emphasize potential interactions between the philosophical field of animal ethics and behavioral sciences. Ethical issues raised by research in behavioral sciences are a related, though different and narrower issue. On top of legal requirements, professional organizations have taken further practical steps to ensure that ethical issues related to animal welfare are an integral part of the design of the research being conducted by setting up their own standards (see the Association for the Study of Animal Behaviour's (2012) guidelines and the Guidelines for Ethical Conduct in the Care and Use of Nonhuman Animals in Research by the American Psychological Association (2010)). The main scientific journals in psychology and behavioral ecology require that these standards be met to publish a paper. It certainly does not mean that all ethical issues associated with animal behavior sciences have been thoroughly resolved, and future work should strive to keep ethics questions central to its interests. Empirical work attempting to measure the stress, pain, and mortality caused by study protocols is an emerging field of research (e.g., Hämäläinen, Heistermann, Fenosa, & Kraus, 2014; Le Maho et al., 2011), and several recent reviews have been dedicated to these and other ethical issues (Costello et al., 2016; Field et al., 2019; Mackinnon & Riley, 2010).