COURSE SYLLABUS

COURSE INFORMATION Course Name: Introductory Topics in Applied Biology ("Animal Cognition"). Course Code Number: 290 201. Class Time & Place: Tuesdays (9:30am -11am) & Thursdays (9:30am -11am) in <u>PCN-1003</u>.

COURSE PREREQUISITES/ COREQUISITES

None.

LAND ACKNOWLEDGEMENT

I want to acknowledge that UBC's Point Grey campus and endowment lands are the traditional, ancestral, unceded territory of the Musqueam. The hənqəminəm (*h-elk-kwah-MEEN-um*) speaking Musqueam people have, and have always had, a distinct understanding of animals that has been passed from one generation to the next and we are grateful for the opportunity to learn and work on this land (credit: Allison Cuffley, BC SPCA).

YOUR TEACHING TEAM

Instructor	ТА
Dr. Camila Cavalli	Oceania Kreutzer
camila.cavalli@ubc.ca	oceania.kreutzer@ubc.ca
Offic	e hours
We are hanny to meet in person/over 7	oom whenever it is mutually convenient

Please send an email to coordinate.



Hi, I am Camila (she/her) and I am excited to be your instructor for this course!

My Ph.D. is in Psychology, and my research is focused on the behaviour and welfare of domestic dogs; with a particular emphasis on therapy dogs and dog-human interactions.

Expect to hear lot about dogs on this class, including anecdotes of my own pup, Kira.



Hi, my name is Oceania, and I am thrilled to be the TA this semester.

I am currently doing my MSc. in the Animal Welfare program in the companion animal lab. My focus is on the behaviour of domestic rabbits specifically in shelters and in urban environments.

A fun fact about me is that I have had over 10 different species of animals as pets throughout my life.

DIVERSITY & INCLUSION

I intent to create an inclusive learning environment in my classroom. As a teacher I aim to promote autonomy and encourage lifelong learning, which I do through mutual trust and respect.

I approach teaching this course with the firm belief that all students can learn well and succeed, and my focus is on providing you with the materials, activities, and supports needed for you to do so.

Your suggestions are encouraged and appreciated, please let me know ways to improve the effectiveness of this course and/or make it more accessible to you.

WHAT IS THIS COURSE ABOUT?

"What a bizarre animal we are that the only question we can ask in relation to our place in nature is 'Mirror, mirror on the wall, who is the smartest of them all?" Frans de Waal (2016)

In this course you will get an introduction to the interdisciplinary field of Comparative Cognition. Traditionally, "Comparative Psychology" has been regarded as the comparison of the behaviour of different species, usually considering human behaviour as the standard to what non-human species are compared. Some of the big ideas for this course are "different species perceive the world differently" and "the human way is not the only way". Drawing from the fields of Animal Behaviour, Philosophy and Psychology, we will compare species in diverse areas such as their particularities to perceive the environment, how physical cognition affects their problem-solving abilities and tool use, as well as their differences in social cognition, prosocial behaviour and communication. Through all this, we will question the notion of humans being the sole parameter of comparison, and promote a critical view that allows us to embrace each species' uniqueness. This understanding of animal cognition will be helpful to take on more advanced courses in related fields, as well as it has important applications for assuring animal welfare.

COURSE FORMAT/ STRUCTURE

The class will meet in person twice per week. Classes will include lectures and discussions. The lecture portion will include the presentation of content material from the required textbook as well as from other textbooks and internet sources such as videos and webinars. Research papers featuring different species will be provided to serve as basis of discussion about the topic as well as the research methods employed.

LEARNING MATERIALS

Learning materials will include the following textbook, lecture slides and assigned readings provided by the instructor as indicated on the schedule.

Required textbook:



De Waal, F. (2016). Are we smart enough to know how smart animals are? WW Norton & Company.

Available on: Amazon, Indigo-Chapter, some independent bookstores, UBC library (note: may not be available at UBC bookstore), eBook. Estimated price \$23 (paperback, new).

Additional readings: Please go to the Modules section on Canvas for Article Readings and lecture slides per class. Slides will be made available on Canvas the day before each lesson.

Recommended – <u>but optional</u> – readings:

- Dugatkin, L. A. (2020). *Principles of animal behavior*. University of Chicago Press.
- Wynne, C. D., & Udell, M. A. (2020). *Animal cognition: Evolution, behavior and cognition*. Bloomsbury Publishing.
- Yong, E. (2022). *An immense world: How animal senses reveal the hidden realms around us.* Knopf Canada.

COURSE SCHEDULE/ SCHEDULE OF TOPICS

(Please see detailed schedule at the end of this document)

Week 1	Introduction
	Principles of Animal Behaviour / Levels of Analysis
Week 2	Evolution of Behaviour
	Umwelt / Perception 1/ Anthropomorphism
Week 3	Perception 2
	Perception 3
Week 4	Methods 1 / Learning
	Reasoning / Problem solving (Intelligence~) / Physical Cognition
Week 5	Tool use
	Navigation
Week 6	Memory
	Foraging / Self-recognition
Week 7	Midterm break
	Midterm break
Week 8	Personality
	Impulsivity
Week 9	Methods 2
	Theory of Mind / Empathy / Rescue Behaviour
Week 10	Social learning
	Imitation
Week 11	Communication & Language
	Cooperation
Week 12	Aggression
	Play
Week 13	Closing
	Presentations
Week 14	Presentations

YOUR LEARNING GOALS

By the end of this course, you should be able to:

- Describe key concepts and themes in the study of animal cognition.
- Reflect on the adaptive values of the behaviour of different species.
- Critically compare and contrast the cognitive abilities of different species.
- Articulate conceptual and methodological problems related to the research in animal cognition.
- Challenge the notion of anthropocentrism.

LEARNING APPROACH/ACTIVITIES

The class period will be devoted to lecture and discussions with your peers in pairs and groups, which will be based on the textbook, reading scientific papers and/or watching videos related to the topic.

The key activities in the course are (1) learning about different aspects of animal cognition, (2) communicating an understanding of these topics through in-person discussion, in-class probes, and assignments submitted online.

Teamwork: Working in teams is a major component of this course. I value peer-to-peer learning as a dynamic approach, where shared perspectives enhance understanding and engagement with the material. Teams will create a "team contract" as part of Assignment 1. Assignments 1 and 4 will include a Peer Evaluation component which will be used for grading.

Contribution to your team is valued: Peer Evaluation will be conducted on-line using iPeer.

- All students receiving more than 70% as evaluated by their teammates will receive the actual grade of the assignment.
- Students who do not reach 70% for their peer evaluation will have their grade adjusted by the percentage awarded by the teammates.
- Please note that, although it rarely happens, a score of zero will be considered when the average peer evaluation score is less than 25% and I receive sufficient evidence that the student had not contributed to the assignment.

LEARNING APPRAISALS

You will complete two online assignments, in-class probes, and a final project throughout the course. Rubrics will be provided beforehand.

You have some choice: Note that written assignments have components that will be selected by you/your team according to your interests and preferences.

Assignment 1 (15%)

In groups (of approx. 5 students), you will select a recent research article from a peer-reviewed journal (featuring at least one empirical study related to the topics that have been covered in weeks 1 through 4) and write a concise 1–2-page summary. Additionally, you will explain why that article was selected and include a short discussion suggesting further research, questioning the reasoning of the authors, and/or integrating this study with topics seen in class.

Assignment 2 (30%)

Individually, you will consider the topics covered in weeks 4 through 7 and write a short essay (2–3 pages) comparing and contrasting:

- One of the studied domains (e.g., tool use) in two different species. OR
- Two different domains (e.g., foraging and problem solving) in one species.

In-class probes (20%)

There will be 14 probes conducted during class, and your grade will account for the best 10 out of them. As probes provide credit for class participation and encourage attendance, it will not be announced in advance when they will occur. Each probe will be worth 2 points, you will receive 1 point for attempting to answer and 1 point for answering correctly. Probes will cover the readings and/or material presented in class. Probes will require short answers and are aimed to be typically completed in about 5 minutes.

Final Project (35%)

In groups (of approx. 5 students), you will select either a fictional creature (e.g., mythological animal) or invent your own. You should identify traits relevant to their survival, consider the cognitive processes of this given species and propose appropriate research methods for its study. You are free to present their idea in written form, record a video or create an infographic. Creativity is welcomed and encouraged.

Supporting your success – **late submission policy:** I trust that you will aim to make our deadlines, but I understand that sometimes unexpected events happen. I generally allow for a grace period after each assignment, which is available for everyone to use without question or explanation, supporting your privacy and autonomy. Please be mindful of your teammate's and communicate with them in advance if you are not able to complete teamwork on time. If you need more support beyond this, please reach out to me as soon as possible.

Evaluation

Assignment 1	15%
Assignment 2	30%
In-class probes	20%
Final Project	<u>35%</u>
-	100%

UBC Grading chart

A+	90-100%	\mathbf{B}^+	76-79%	C+	64-67%	D	50-54%
А	85-89%	В	72-75%	С	60-63%	F	0-49%
A-	80-84%	B-	68-71%	C-	55-59%		

UNIVERSITY POLICIES

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website.

ACADEMIC INTEGRITY

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences. A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar.

Use of Generative AI tools

Students are permitted to use artificial intelligence tools, including generative AI, to gather information, review concepts or to help produce assignments. <u>However, students are ultimately</u> accountable for the work they submit, and any content generated or supported by an artificial intelligence tool must be cited appropriately. For guidelines on how to cite generative AI, see the <u>Generative AI Tools FAQ</u>.

APPENDIX: SCHEDULE

Please check Canvas for the most updated version of the schedule. I'll use Announcements to notify you of any changes.

Week	Date	Topic	Readings	Assignments
Week 1	Jan 7	Welcome	Syllabus	
	Jan 9	Principles of Animal Behaviour/ Levels of Analysis	 Bateson, P., & Laland, K. N. (2013). Tinbergen's four questions: an appreciation and an update. <i>Trends in ecology &</i> <i>evolution</i>, 28(12), 712-718. Levitis, D. A., Lidicker Jr, W. Z., & Freund, G. (2009). Behavioural biologists do not agree on what constitutes behaviour. <i>Animal</i> <i>behaviour</i>, 78(1), 103-110. <i>Optional</i>: Niko Tinbergen's 4 Questions - EvoS Seminar Series: https://www.youtube.com/watch?y=8NPLI6iH51z 	
			s&t=72s	
Week 2	Jan 14	Evolution of Behaviour	 de Waal. Ch 9. Dugatkin, L. A. (2018). The silver fox domestication experiment. <i>Evolution: Education and Outreach</i>, <i>11</i>(1), 1-5. Gregory, T. R. (2009). Understanding natural selection: essential concepts and common misconceptions. <i>Evolution: Education and outreach</i>, <i>2</i>(2), 156-175. Optional: 	
			- Wynne & Udell. Ch 1.	
	Jan 16	Umwelt / Perception 1 Anthropomorphism	 de Waal. Ch 1 Bolhuis, J. J., & Wynne, C. D. (2009). Can evolution explain how minds work? <i>Nature</i>, 458(7240), 832-833. de Waal, F. B. (2009). Darwin's last laugh. <i>Nature</i>, 460(7252), 175-175. Duranton, C., & Horowitz, A. (2019). Let me sniff! Nosework induces positive judgment bias in pet dogs. <i>Applied Animal Behaviour</i> <i>Science</i>, 211, 61-66. 	
			<i>Optional:</i> Yong, E. (2022). <i>An immense world: How animal</i> <i>senses reveal the hidden realms around us.</i> Knopf Canada. Wynne & Udell. Ch 2.	
Week 3	Jan 21	Perception 2	 Adamczyk, K., Górecka-Bruzda, A., Nowicki, J., Gumulka, M., Molik, E., Schwarz, T., & Klocek, C. (2015). Perception of environment in farm animals-A review. <i>Annals of Animal Science</i>, 15(3), 565. Rose, J. D., Arlinghaus, R., Cooke, S. J., Diggles, B. K., Sawynok, W., Stevens, E. D., 	

	Jan 23	Perception 3	 & Wynne, C. D. (2014). Can fish really feel pain? Fish and Fisheries, 15(1), 97-133. Optional: Yong, E. (2022). An immense world: How animal senses reveal the hidden realms around us. Knopf Canada. de Waal. Ch 2. Optional: Yong, E. (2022). An immense world: How animal senses reveal the hidden realms around us. Knopf Canada. 	Instructions for Assignment 1
Week 4	Jan 28	Methods 1/ Learning	 Wynne & Udell. Ch 1. Hall, N. J. (2017). Persistence and resistance to extinction in the domestic dog: Basic research and applications to canine training. <i>Behavioural Processes</i>, 141, 67-74. Rescorla, R. A. (1967). Pavlovian conditioning and its proper control procedures. <i>Psychological review</i>, 74(1), 71. Søndergaard, E., Jensen, M. B., & Nicol, C. J. (2011). Motivation for social contact in horses measured by operant conditioning. <i>Applied Animal Behaviour Science</i>, 132(3-4), 131- 137. <i>Optional</i>: Wurne & Udell. Ch 5. 	
	Jan 30	Reasoning / problem solving Intelligence~ Physical Cognition	 wynne & Oden. Ch J. de Waal. Ch 3. Chow, P. K. Y., Lea, S. E., & Leaver, L. A. (2016). How practice makes perfect: the role of persistence, flexibility and learning in problem-solving efficiency. <i>Animal Behaviour</i>, <i>112</i>, 273-283. Clark, F. E. (2013). Marine mammal cognition and captive care: A proposal for cognitive enrichment in zoos and aquariums. <i>Journal of Zoo and Aquarium Research</i>, <i>1</i>(1), 1-6. Griffin, A. S., & Guez, D. (2014). Innovation and problem solving: a review of common mechanisms. <i>Behavioural Processes</i>, <i>109</i>, 121-134. 	
Week 5	Feb 4	Tool use	 de Waal. Ch 3. Rutz, C., Sugasawa, S., Van der Wal, J. E., Klump, B. C., & St Clair, J. J. (2016). Tool bending in New Caledonian crows. <i>Royal</i> <i>Society open science</i>, 3(8), 160439. St Amant, R., & Horton, T. E. (2008). Revisiting the definition of animal tool use. <i>Animal Behaviour</i>, 75(4), 1199-1208. Are crows the ultimate problem solvers? 	

			https://www.youtube.com/watch?v=cbSu2PXOT Oc	
			Wynne & Udell. Ch 6.	
	Feb 6	Navigation	 Kelly, D. M., Cheng, K., Balda, R., & Kamil, A. C. (2019). Effects of sun compass error on spatial search by Clark's nutcrackers. <i>Integrative Zoology</i>, <i>14</i>(2), 172- 181. Sotelo, M. I., Bingman, V. P., & Muzio, R. N. (2015). Goal orientation by geometric and feature cues: spatial learning in the terrestrial toad Rhinella arenarum. <i>Animal</i> <i>Cognition</i>, <i>18</i>, 315-323. Vallortigara, G. (2006). The cognitive chicken: Visual and spatial cognition in a nonmammalian brain. Comparative cognition: <i>Experimental explorations of</i> <i>animal intelligence</i>, 53-70. 	
			<i>Optional</i> : Wiltschko, W., & Wiltschko, R. (2005). Magnetic orientation and magnetoreception in birds and other animals. <i>Journal of comparative physiology</i> <i>A</i> , 191, 675-693.	
			Wynne & Udell. Ch 7.	
	Feb 7			Assignment 1 deadline
Week 6	Feb 11	Memory	 Fujita, K., Morisaki, A., Takaoka, A., Maeda, T., & Hori, Y. (2012). Incidental memory in dogs (<i>Canis familiaris</i>): adaptive behavioral solution at an unexpected memory test. <i>Animal Cognition</i>, 15(6), 1055-1063. Gutnick, T., Weissenbacher, A., & Kuba, M. J. (2020). The underestimated giants: operant conditioning, visual discrimination and long-term memory in giant tortoises. <i>Animal Cognition</i>, 23, 159-167. <i>Optional</i>: Wynne & Udell. Ch 10 	Instructions for Assignment 2
	Feb 13	Foraging/	de Waal. Ch 8.	
		Self recognition	- de Waal, F. B. (2019). Fish, mirrors, and a gradualist perspective on self-awareness. <i>PLoS Biology</i> , <i>17</i> (2), e3000112.	

Week 7	Feb 18		 are the implications for consciousness and self-awareness testing in animals?. <i>PLoS biology</i>, <i>17</i>(2), e3000021. Kohda, M., Sogawa, S., Jordan, A. L., Kubo, N., Awata, S., Satoh, S., & Bshary, R. (2022). Further evidence for the capacity of mirror self-recognition in cleaner fish and the significance of ecologically relevant marks. <i>PLoS biology</i>, <i>20</i>(2), e3001529. Vonk, J. (2020). A fish eye view of the mirror test. <i>Learning & Behavior</i>, <i>48</i>, 193-194. Midterm break 	
Week 8	Feb 20 Feb 25	Personality	- Carter A I Feeney W F Marshall H H	
			 Cowlishaw, G., & Heinsohn, R. (2013). Animal personality: what are behavioural ecologists measuring? <i>Biological</i> <i>Reviews</i>, 88(2), 465-475. Finkemeier, M. A., Langbein, J., & Puppe, B. (2018). Personality research in mammalian farm animals: concepts, measures, and relationship to welfare. <i>Frontiers in</i> <i>veterinary science</i>, 5, 131. MacKinlay, R. D., & Shaw, R. C. (2023). A systematic review of animal personality in conservation science. <i>Conservation</i> <i>Biology</i>, 37(1), e13935. Stamps, J., & Groothuis, T. G. (2010). The development of animal personality: relevance, concepts and perspectives. <i>Biological Reviews</i>, 85(2), 301- 325. 	
	Feb 26			Check-in Assignment 2
	Feb 27	Impulsivity	De Waal. Ch 7.	- isoigninent #
Week 0	Mor 4	Mathods 2	 Bari, A., & Robbins, T. W. (2013). Inhibition and impulsivity: behavioral and neural basis of response control. <i>Progress in neurobiology, 108</i>, 44-79. Beran, Michael J. (2015). The comparative science of "self-control": what are we talking about?. <i>Frontiers in psychology</i> 6:51. MacLean, E. L., Hare, B., Nunn, C. L., Addessi, E., Amici, F., Anderson, R. C., & Zhao, Y. (2014). The evolution of self-control. <i>Proceedings of the National Academy of Sciences, 111</i>(20), E2140-E2148. Schnell, A. K., Boeckle, M., & Clayton, N. S. (2022). Waiting for a better possibility: delay of gratification in corvids and its relationship to other cognitive capacities. <i>Philosophical Transactions of the Royal Society B</i>, 377(1866), 20210348. 	
week 9	Mar 4	Wethods 2	- Clark, H., Elsherit, M. M., y Leavens, D. A. (2019). Ontogeny vs. phylogenv in	

	Mar 6	Theory of Mind / empathy / rescue	 primate/canid comparisons: A meta-analysis of the object choice task. <i>Neuroscience y Biobehavioral Reviews</i>, 105, 178-189. Haslam, M. (2013). 'Captivity bias' in animal tool use and its implications for the evolution of hominin technology. <i>Philosophical Transactions of the Royal Society B: Biological Sciences</i>, 368(1630), 20120421. Hopkins, W. D., Russell, J., McIntyre, J., & Leavens, D. A. (2013). Are chimpanzees really so poor at understanding imperative pointing? Some new data and an alternative view of canine and ape social cognition. PLoS One, 8(11), e79338. Krause, M. A., Udell, M. A., Leavens, D. A., & Skopos, L. (2018). Animal pointing: Changing trends and findings from 30 years of research. <i>Journal of Comparative Psychology</i>, 132(3), 326. De Waal. Ch 5. Carballo, F., Dzik, V., Freidin, E., Damián, J. P., Casanave, E. B., & Bentosela, M. (2020). Do dogs rescue their owners from a stressful situation? A behavioral and physiological assessment. <i>Animal Cognition</i>, 23(2), 389-403. de Waal, F. B., y Preston, S. D. (2017). Mammalian empathy: behavioural manifestations and neural basis. <i>Nature Reviews Neuroscience</i>, 18(8), 498-509. Krupenye, C., & Call, J. (2019). Theory of mind in animals: Current and future directions. Wiley Interdisciplinary Reviews: Cognitive Science, 10(6), e1503. Masilkova, M., Ježek, M., Silovský, V., Faltusová, M., Rohla, J., Kušta, T., & Burda, H. (2021). Observation of rescue behaviour in wild boar (Sus scrofa). <i>Scientific reports</i>, <i>11</i>(1), 16217. Van Bourg, J., Patterson, J. E., & Wynne, C. D. (2020). Pet dogs (Canis lupus familiaris) release their trapped and distressed owners: Individual variation and evidence of emotional contagion. <i>PLoS One</i>, <i>15</i>(4), e0231742. 	
	Mar 7		Wynne & Udell. Ch 8.	Assignment 2
Wealt	Mor 11	Social loarning	da Waal Ch ?	deadline
10	19101 11	Social learning	 Avarguès-Weber, A., Dawson, E. H., & Chittka, L. (2013). Mechanisms of social learning across species boundaries. <i>Journal of</i> <i>zoology</i>, 290(1), 1-11. 	for final project

	Mar 13	Imitation	 Fugazza, C., Moesta, A., Pogány, Á., & Miklósi, Á. (2018). Social learning from conspecifics and humans in dog puppies. <i>Scientific reports</i>, 8(1), 9257. <i>Optional</i>: Wynne & Udell. Ch 9. Hoehl, S., Keupp, S., Schleihauf, H., McGuigan, N., Buttelmann, D., & Whiten, A. (2019). 'Over-imitation': A review and appraisal of a decade of research. <i>Developmental Review</i>, 51, 90-108. Huber, L., Range, F., Voelkl, B., Szucsich, A., Viranyi, Z., & Miklosi, A. (2009). The evolution of imitation: what do the capacities of non-human animals tell us about the mechanisms of imitation?. Philosophical Transactions of the Royal Society B: Biological Sciences, 364(1528), 2299-2309.
Week 11	Mar 18	Communication & Language	 de Waal. Ch 4. Fugazza, C., Dror, S., Sommese, A., Temesi, A., & Miklósi, Á. (2021). Word learning dogs (Canis familiaris) provide an animal model for studying exceptional performance. <i>Scientific Reports</i>, 11(1), 14070 Kulick, D. (2017). Human–animal communication. <i>Annual Review of</i> <i>Anthropology</i>, 46, 357-378. Leavens, D. A., Russell, J. L., & Hopkins, W. D. (2005). Intentionality as measured in the persistence and elaboration of communication by chimpanzees (Pan troglodytes). <i>Child development</i>, 76(1), 291-306.
	Mar 20	Cooperation	 wynne & Odell. Ch 11 & 12. de Waal. Ch 6. Carballo, F., Freidin, E., Putrino, N., Shimabukuro, C., Casanave, E., & Bentosela, M. (2015). Dog's discrimination of human selfish and generous attitudes: the role of individual recognition, experience, and experimenters' gender. <i>PLoS One</i>, 10(2), e0116314. Marshall-Pescini, S., Dale, R., Quervel- Chaumette, M., & Range, F. (2016). Critical issues in experimental studies of prosociality in non-human species. <i>Animal Cognition</i>, 19(4), 679-705. Taborsky, M., & Taborsky, B. (2015). Evolution of genetic and physiological mechanisms of cooperative behaviour. <i>Current Opinion in Behavioral Sciences</i>, 6, 132-138.

Week 12	Mar 25	Aggression	 Arnott, G., & Elwood, R. W. (2009). Assessment of fighting ability in animal contests. <i>Animal Behaviour</i>, 77(5), 991- 1004. Emlen, D. J. (2008). The evolution of animal weapons. <i>Annual review of ecology,</i> <i>evolution, and systematics, 39</i>, 387-413. Hsu, Y., Lee, I. H., & Lu, C. K. (2009). Prior 	In-class time to work on final project
			winner and loser effects. <i>Behavioral Ecology and</i> Sociabiology 63, 1247-1257	
	Mar 27	Play	 Held, S. D., & Špinka, M. (2011). Animal play and animal welfare. <i>Animal behaviour</i>, <i>81</i>(5), 891-899. Horowitz, A. (2009). Attention to attention in domestic dog (Canis familiaris) dyadic play. <i>Animal Cognition</i>, 12, 107-118. Miller, L. J. (2017). Creating a common terminology for play behavior to increase cross-disciplinary research. <i>Learning & Behavior</i>, <i>45</i>, 330-334. Palagi, E., Burghardt, G. M., Smuts, B., Cordoni, G., Dall'Olio, S., Fouts, H. N., & Pellis, S. M. (2016). Rough-and-tumble play as a window on animal communication. <i>Biological Reviews</i>, <i>91</i>(2), 311-327. 	In-class time to work on final project
Week	Mar 31			Final Project
13				deadline
	Apr 1	Closing		
	Apr 3	Presentations		
Week 14	Apr 8	Presentations		