

# JENNIFER VAN OS

**Assistant Professor and Extension Specialist – Animal Welfare**

Department of Dairy Science  
University of Wisconsin-Madison

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www.DairyAnimalWelfare.org

## EDUCATION

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Ph.D., Animal Behavior, University of California, Davis, CA (2010 – 2015)

B.A., Psychology, *Magna cum Laude*, Harvard University, Cambridge, MA (2000 – 2004)

## RESEARCH EXPERIENCE

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**Principal Investigator** (2018 – Present)

Department of Dairy Science, University of Wisconsin-Madison (UW-Madison)

*Research Focus:* Understanding, evaluating, and improving the welfare of dairy animals from a biological perspective

**Postdoctoral Research** (2017)

Faculty of Land and Food Systems, University of British Columbia

*Research Focus:* Improving housing for weaned heifers and evaluating grooming behavior; sampling methodology for welfare assessments; understanding abnormal defecation behavior

*Principal Investigators:* Nina von Keyserlingk, Ph.D. and Dan Weary, Ph.D.

**Postdoctoral Research** (2016)

Department of Animal Science, University of California (UC) Davis

*Research Focus:* Dairy cattle comfort when exposed to conditions such as heat and mud; sampling methodology for behavior and welfare; feeding motivation in feedlot cattle

*Principal Investigator:* Cassandra Tucker, Ph.D.

**Doctoral Dissertation Research** (2010 – 2015)

Department of Animal Science, UC Davis

*Dissertation:* Cooling dairy cows efficiently with sprinklers: Behavioral, physiological, and production responses to water spray

*Committee:* Cassandra Tucker, Ph.D. (*supervisor*), Joy Mench, Ph.D., Karin Schütz, Ph.D.

## PUBLICATIONS

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### *Refereed Papers*

13. **Van Os, Jennifer M. C.**, Daniel M. Weary, Joao H. C. Costa, Maria J. Hötzel, and Marina A. G. von Keyserlingk. 2018 (*in review*). Sampling strategies for assessing lameness, injuries, and body condition score on dairy farms. *Journal of Dairy Science*.
12. Wang, Xiaoshuai, Hongding Gao, Kifle G. Gebremedhin, Bjarne Schmidt Bjerg, **Jennifer Van Os**, Cassandra B. Tucker, Guoqiang Zhang. 2018. A predictive model of Equivalent

- Temperature Index for dairy cattle (ETIC). *Journal of Thermal Biology* 76:165-170. doi:10.1016/j.jtherbio.2018.07.013.
11. **Van Os, Jennifer M. C.**, Erin M. Mintline, Trevor J. DeVries, and Cassandra B. Tucker. 2018. Domestic cattle (*Bos taurus taurus*) are motivated to obtain forage and will demonstrate contrafreeloading. *PLoS ONE*. doi:10.1371/journal.pone.0193109.
  10. **Van Os, Jennifer M. C.**, Christoph Winckler, Julia Trieb, Soraia V. Matarazzo, Terry W. Lehenbauer, John D. Champagne, and Cassandra B. Tucker. 2018. Reliability of sampling strategies for measuring dairy cattle welfare on commercial farms. *Journal of Dairy Science* 101:1495-1504. doi:10.3168/jds.2017-13611.
  9. **Van Os, Jennifer M. C.**, Erin M. Mintline, Trevor J. DeVries, and Cassandra B. Tucker. 2017. Motivation of naïve feedlot cattle to obtain grain and individual responses to novelty. *Applied Animal Behaviour Science* 197:68-74. doi:10.1016/j.applanim.2017.09.001.
  8. **Chen, Jennifer M.**, Carolyn L. Stull, David N. Ledgerwood, and Cassandra B. Tucker. 2017. Muddy conditions reduce hygiene and lying time in dairy cattle and increase time spent on concrete. *Journal of Dairy Science* 100:2090-2103. doi:10.3168/jds.2016-11972.
  7. **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. 2016. Technical note: Comparison of instantaneous sampling and continuous observation of dairy cattle behavior in freestall housing. *Journal of Dairy Science* 99:8341-8346. doi:10.3168/jds.2016-11351.
  6. **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. 2016. Cooling cows efficiently with water spray: Behavioral, physiological, and production responses to sprinklers at the feed bunk. *Journal of Dairy Science* 99:4607-4618. doi:10.3168/jds.2015-10714.
  5. **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. 2016. Sprinkler flow rate affects dairy cattle avoidance of spray to the head, but not overall, in an aversion race. *Applied Animal Behaviour Science* 179:23-31. doi:10.1016/j.applanim.2016.03.007.
  4. **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. 2016. Sprinkler flow rate affects dairy cattle preferences, heat load, and insect-deterrence behavior. *Applied Animal Behaviour Science* 182:1-8. doi:10.1016/j.applanim.2016.05.023.
  3. **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. 2015. Cooling cows efficiently with sprinklers: Physiological responses to water spray. *Journal of Dairy Science* 98:6925-6938. doi:10.3168/jds.2015-9434.
  2. **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. 2013. Dairy cows use and prefer feed bunks fitted with sprinklers. *Journal of Dairy Science* 96:5035-5045. doi:10.3168/jds.2012-6282.
  1. Gallo, David A., **Jennifer M. Chen**, Amy L. Wiseman, Daniel L. Schacter, and Andrew E. Budson. 2007. Retrieval monitoring and anosognosia in Alzheimer's disease. *Neuropsychology* 21:559-568. doi:10.1037/0894-4105.21.5.559.

#### ***Invited Chapter***

**Van Os, Jennifer M. C.** 2019. Considerations for cooling dairy cows with water. *Veterinary Clinics of North America: Food Animal Practice* 35:157-173. doi:10.1016/j.cvfa.2018.10.009. In *Housing to Optimize Comfort, Health and Productivity of Dairy Cattle*, edited by Nigel B. Cook.

***Manuscripts in Preparation***

§*Van Os mentee*

§Salter, Rekia S., §Reuscher, Kimberly, Mario Mondaca, and **Jennifer M. C. Van Os**. Cooling effectiveness of spraying individual cows with water during milking in the parlor.

**Van Os, Jennifer M. C.**, §Savannah A. Goldstein, Daniel M. Weary, and Marina A. G. von Keyserlingk. Provision of stall-mounted brushes to improve the introduction of heifers to freestall housing.

**Van Os, Jennifer M. C.**, §Savannah A. Goldstein, Daniel M. Weary, and Marina A. G. von Keyserlingk. Usage patterns and preference for wall-mounted brushes by weaned dairy heifers.

§Mangilli, Livia G., **Jennifer M. C. Van Os**, Marina A. G. von Keyserlingk, Jose A. Fregonesi, and Daniel M. Weary. Characterization of lying defecation behavior in lactating cows.

§Mangilli, Livia G., **Jennifer M. C. Van Os**, Marina A. G. von Keyserlingk, Jose A. Fregonesi, and Daniel M. Weary. Effects of freestall stocking density on lying defecation behavior in lactating cows.

**Van Os, Jennifer M. C.**, Karin E. Schütz, and Cassandra B. Tucker. Cooling cows efficiently with sprinklers: Physiological responses to spray applied for different amounts of time.

***Technology-transfer Publications***

**Van Os, Jennifer.** July, 2018. Cow-centric approach leads to wins for cow and producer. *Dairy's Bottom Line* 20(5):2-3.

**Chen, Jennifer M.**, Grazyne Tresoldi, and Cassandra B. Tucker. May, 2016. Enfriamiento eficiente de vacas lecheras en condiciones de calor (Efficient cooling of dairy cows in hot conditions). *Albéitar* 196:12-14.

**Chen, Jennifer M.**, Grazyne Tresoldi, and Cassandra B. Tucker. 2014. Are your cows hot? *Hoard's Dairyman Magazine* July:447. [In Spanish: Sept:570-571]

**Chen, Jennifer M.** and Cassandra B. Tucker. 2014. Water costs: Soaker nozzle type affects water use, but not cow cooling. *California Dairy Magazine* Oct:12.

**Chen, Jennifer M.** and Cassandra B. Tucker. 2014. Soaker nozzle type affects water use, but not cow cooling. *California Dairy Newsletter*. University of California Agriculture and Natural Resources. July:5-6.

**TEACHING AND MENTORING EXPERIENCE**

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**Graduate and Undergraduate Mentoring, UW-Madison**

Major professor for MSc theses: Rekia Salter (matriculated summer, 2018), Kimberly Reuscher (matriculated fall, 2018)

PI for undergraduate research assistants: Emma Eppig (Dairy Science), Kehan Sky Sheng (Animal Science), Yatong Tiffany Feng (Statistics), Amanda Gimenez (Animal Science)

### **Graduate and Undergraduate Mentoring, UBC**

Co-supervised Applied Animal Biology undergraduate thesis (2017 – 2018): Savannah Goldstein, “The use of stationary wall-mounted brushes by weaned dairy heifers,” and supervised research assistant Jessica St-Pierre.

Co-supervising doctoral thesis (2017 – Present): Livia Mangilli, Universidade Estadual de Londrina, Parana, Brazil.

### **Teaching Assistant, UC Davis**

Delivered lectures, led laboratory and discussion sections, developed curriculum material, supervised undergraduate teaching assistants, graded assignments and exams

Animal Welfare (ANS 103; 2013)  
Domestic Animal Behavior (ANS 104; 2014)  
Domestic Animal Production (ANS 41; 2014)  
Domestic Animal Production Laboratory (ANS 41L; 2012)  
Introduction to Biology: Principles of Ecology & Evolution (BIS 2B; 2011 – 2015)  
Introduction to Ecology (EVE 101; 2015)  
Introductory Horse Husbandry (ANS 15; 2015)  
Statistical Analysis of Psychological Data (PSC 103A; 2010)

### **Undergraduate Mentoring, UC Davis**

Co-supervised Animal Biology thesis (2013 – 2015): Alex Tsai, “Dairy cattle change head posture when walking through cooling sprinklers with higher flow rates”

Supervised 21 research assistants (2011 – 2015): Jordan Alarcon, Esteban Aleman, Setareh Badr, Laura Baldwin, Theresa Chao, Renee Dematei, Amanda Dilbeck, Zoe Hsi, Steven Hsu, Ivana Hui, Laura MacIntyre, Louise Peckre, Rianna Ragland, Anna Roach, Ingrid Rodriguez, Cierra Scriven, Katherine Swanson, Veronica Wang, Matthew Warren, Sarah Watkins, Aaron Yoder

Supervised 2 teaching assistants (2011 – 2013): Janice Feng, Julian Roque

## **GRANTS, AWARDS, FELLOWSHIPS, AND SCHOLARSHIPS**

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### ***Grants***

**Van Os, Jennifer.** 2019-2020. Effects of teat and bucket feeding of milk and starter on the performance and behavior of individually and pair-housed calves in outdoor hutches. USDA-Hatch. \$74,274.

Weigel, Kent, Heather White, **Jennifer Van Os.** 2019-2022. Understanding the relationships between metabolic status, social order, and feed efficiency in lactating dairy cattle. USDA Hatch-Multidisciplinary. \$137,547.

**Van Os, Jennifer,** Nigel B. Cook. *Submitted 2018.* Improving dairy cow productivity and welfare using proper airflow and heat exchange in the microenvironment of the resting area. USDA-NIFA-AFRI, A1701 – Critical Agricultural Research and Extension, Animal Health and Production and Animal Well-Being. \$300,000.

Kim, Younghyun, Christopher Y. Choi, **Jennifer M. Van Os**. *Submitted 2018*. Combating heat stress in dairy cattle using multi-modal real-time sensing and machine learning. USDA-NIFA-AFRI, Agricultural Systems and Technology, A1521 Agricultural Engineering. \$500,000.

Henry A. Jastro Graduate Research Award (2013: \$3,000; 2012: \$3,000; 2011: \$2,000)

### **Awards**

Student Poster Competition: *First Place* (2015: \$1,250). California Animal Nutrition Conference, Fresno, CA

Graduate Student Oral Presentation Competition: *First Place* (2014: \$150). 12<sup>th</sup> North American Regional Meeting of the International Society for Applied Ethology (ISAE), East Lansing, MI

People's Choice for Best Oral Presentation: *First Place* (2013: \$200). Interdisciplinary Graduate and Professional Student Symposium, UC Davis

Student Poster Competition: *First Place* (2011). 45<sup>th</sup> Congress of the ISAE, Indianapolis, IN

Graduate Research Fellowship: *Honorable Mention* (2011). National Science Foundation

Harvard Psychology Faculty Prize for honors thesis (2004)

### **Fellowships & Scholarships**

Lillie May Richards Fellowship (2014: \$15,000; 2013: \$15,885; 2012: \$16,200; 2010: \$22,500)

Rosenberg Graduate Research Fellowship (2015: \$4,500)

Hart, Cole, Goss Fellowship (2013: \$4,200)

G. Kirk Swingle Fellowship (2012: \$4,200)

Animal Behavior Graduate Group Fellowship (2011: \$5,232)

Humane Society International/Humane Society US Travel Award (2015: \$200; 2013: \$500)

ISAE Travel Award (2015: £350)

UC Davis Graduate Student Association Travel Award (2011: \$500)

UC Davis Office of Graduate Studies Travel Award (2014: \$500)

## **PRESENTATIONS**

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*\*Presenting author; †Audience including producers and/or industry; §Van Os mentee*

### **Invited Presentations**

**\*†Van Os, Jennifer**. January, 2019. Dairy animal welfare from a producer, consumer, and industry perspective. *Cooperative Resources International Annual Meeting*. Bloomington, MN.

**\*\*Fourdraine, Robert and \*Jennifer Van Os**. January, 2019. Can we develop a quantitative score measuring herd sustainability? *AgSource Annual Meeting*. Bloomington, MN.

- \*†**Van Os, Jennifer.** September, 2018. Animal Welfare. *National Association of Animal Breeders 27<sup>th</sup> Technical Conference on Artificial Insemination and Reproduction.* Green Bay, WI.
- \*†**Van Os, Jennifer.** September, 2018. Dairy animal welfare: Current and emerging trends. *Sysco Animal Welfare Council annual meeting.* Houston, TX.
- \*†**Van Os, Jennifer.** June, 2018. Beyond health: Considerations for promoting good welfare in dairy calves. *Vita Plus Calf Summit: Growing Calves from the Inside Out.* Green Bay, WI.
- \*†**Van Os, Jennifer.** June, 2018. Keynote: Why Millennials care about food animal production practices – and what it means for you. *Dodge County and Fond du Lac County Forage Council Twilight Meeting.* Lomira, WI.
- \*†**Van Os, Jennifer.** April, 2018. Science to understand best practices for promoting dairy cattle welfare. *Dairy Reproduction, Nutrition and Well-Being.* Alma Center and Eau Claire (duplicate programs), WI.
- \*†**Chen, Jennifer M.,** Karin E. Schütz, and Cassandra B. Tucker. May, 2016. Cooling dairy cows efficiently with water: Effects of soaker flow rate on behavior and body temperature. *Dairy Cattle Welfare Symposium: Intersection of Best Practices and Sustainability.* Columbus, OH.
- \*†**Chen, Jennifer M.** and Cassandra B. Tucker. January, 2015. Soakers to cool cows: Can we reduce water use? *Managing Cow Comfort in Hot Weather.* University of California Cooperative Extension, Tulare, CA.
- \***Chen, Jennifer M.,** Grazyne Tresoldi, Karin E. Schütz, and Cassandra B. Tucker. August, 2014. Optimizing use of water for cooling heat stressed dairy cows. *Symposium on Climate Change and Animal Production.* Davis, CA.

### **Refereed Abstracts**

- \***Van Os, Jennifer M. C.,** Daniel M. Weary, Joao H. C. Costa, Maria J. Hötzel, and Marina A. G. von Keyserlingk. June, 2018. *Poster:* Sample size estimates for assessing lameness, leg injuries, and body condition. *Annual Meeting of the American Dairy Science Association (ADSA).* Knoxville, TN.
- Van Os, Jennifer M. C.,** Erin M. Mintline, Trevor J. DeVries, and \*Cassandra B. Tucker. August, 2017. Feedlot cattle are motivated to obtain roughage and show contrafreeloading. *51<sup>st</sup> International Congress of the ISAE.* Aarhus, Denmark.
- \***Van Os, Jennifer M. C.,** Christoph Winckler, Julia Trieb, Soraia V. Matarazzo, Terry W. Lehenbauer, John D. Champagne, and Cassandra B. Tucker. June, 2017. *Poster:* Sampling strategies for dairy cow welfare assessments. *ADSA.* Pittsburgh, PA.
- \***Chen, Jennifer M.,** Karin E. Schütz, and Cassandra B. Tucker. July, 2016. *Poster:* Heat load affects measures of aversion in dairy cows. *50<sup>th</sup> International Congress of the ISAE.* Edinburgh, UK.
- \***Chen, Jennifer M.,** Karin E. Schütz, and Cassandra B. Tucker. September, 2015. Cooling dairy cows efficiently with water: Effects of soaker flow rate on behavior and body temperature. *49<sup>th</sup> International Congress of the ISAE.* Sapporo, Japan.

\*<sup>†</sup> **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. May, 2015. *Poster: Cooling dairy cows efficiently with water: Effects of soaker flow rate on body temperature and behavior. California Animal Nutrition Conference.* Fresno, CA.

\* **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. July, 2014. Sprinkler flow rate affects dairy cattle physiological and behavioral responses. *Joint Annual Meeting of the ADSA and American Society of Animal Science.* Kansas City, MO.

\* **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. May, 2014. Sprinkler flow rate affects dairy cattle behavioral and physiological responses. *12<sup>th</sup> North American Regional Meeting of the ISAE.* East Lansing, MI.

\*<sup>†</sup> **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. May, 2014. *Poster: Sprinkler flow rate affects dairy cattle physiological and behavioral responses. 27<sup>th</sup> ADSA Discover Conference.* Itasca, IL.

\* **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. June, 2013. Dairy cattle preferences for sprinklers delivering different water volumes. *47<sup>th</sup> International Congress of the ISAE.* Florianopolis, Brazil.

\* **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. April, 2013. Dairy cattle interactions with sprinklers used to reduce heat load in summer. *3<sup>rd</sup> Annual Interdisciplinary Graduate and Professional Student Symposium.* Davis, CA.

\* **Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. August, 2011. *Poster: Dairy cattle preferences for feed bunks with or without sprinklers in summer. 45<sup>th</sup> International Congress of the ISAE.* Indianapolis, IN.

### *Non-refereed Meetings*

§Goldstein, Savannah A., **Jennifer Van Os**, Daniel Weary, and Nina von Keyserlingk. March, 2018. *Poster: How will young dairy cattle use the brushes that farmers provide them? Multidisciplinary Undergraduate Research Conference.* Vancouver, BC, Canada.

\*<sup>†</sup> **Chen, Jennifer M.**, Carolyn L. Stull, David N. Ledgerwood, and Cassandra B. Tucker. March, 2017. Muddy conditions reduce cattle comfort. *35<sup>th</sup> Western Canadian Dairy Seminar.* Red Deer, AB, Canada.

\*<sup>†</sup> **Chen, Jennifer M.**, Erin M. Mintline, Trevor J. DeVries, and Cassandra B. Tucker. December, 2016. *Poster: Feeding motivation in feedlot cattle. 100<sup>th</sup> Annual Convention of the California Cattlemen's Association and California Cattlewomen.* Sparks, NV.

\* **Chen, Jennifer M.**, Erin M. Mintline, Trevor J. DeVries, and Cassandra B. Tucker. December, 2016. Feeding motivation in feedlot cattle. *University of California Agriculture and Natural Resources Meat Production and Food Safety Program Team Meeting.* Sparks, NV.

§Tsai, Alex M., **Jennifer M. Chen**, and Cassandra B. Tucker. May, 2015. *Poster: Dairy cows change head posture when walking through cooling sprinklers. 26<sup>th</sup> Annual Undergraduate Research, Scholarship & Creative Activities Conference.* Davis, CA.

\* **Chen, Jennifer M.**, Grazyne Tresoldi, Karin E. Schütz, and Cassandra B. Tucker. July, 2014. Heat abatement on California dairies. *Annual Meeting of the USDA-W2173 Project (Impacts of Stress Factors on Performance, Health, and Well-Being of Farm Animals).* Nebraska City, NE.

\***Chen, Jennifer M.**, Karin E. Schütz, and Cassandra B. Tucker. August, 2013. Dairy cattle physiological and behavioral responses to sprinklers delivering different water volumes. *Annual Meeting of the USDA-W2173 Project*. Davis, CA.

### ***Invited Lectures and Seminars***

Dairy Cattle Welfare. October, 2018 (2 lectures + labs). *Lactation Physiology (DY SCI 305)*. UW-Madison.

Animal Welfare. June, 2018 (4 lectures). *Badger Dairy Camp* (youth ages 12 to 18). UW-Madison.

Animal Welfare. September, 2017 and November, 2018. *Introduction to Animal Sciences (AN SCI/DY SCI 101)*. UW-Madison.

Cooling dairy cows efficiently with sprinklers: Behavioral, physiological, and production responses to water spray. February, 2016. *Department of Animal Science Seminar Series*. UC Davis.

Understanding dairy cow behavior to reduce heat load and conserve water. April, 2015. *Animal Behavior Seminar Series*. UC Davis.

Applying behavior to improve cattle management and welfare. July, 2015 and July, 2014. *Animal Behavior (NPB 102)*. UC Davis.

The dairy industry. May, 2015 and May, 2014. *Ethics of Animal Use (ANS 170)*. UC Davis.

Motivation. February, 2014 (2 lectures). *Domestic Animal Behavior (ANS 104)*. UC Davis.

Dairy cow behavioral research. December, 2013. *River City High School Science Club*. River City High School, West Sacramento, CA.

## **OTHER PROFESSIONAL EXPERIENCE**

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### **Merchandise Planning Analyst (2007 – 2010)**

Sport Chalet, La Cañada, CA

### **Sales and Customer Service Supervisor (2004 – 2007)**

McMaster-Carr Supply Company, Santa Fe Springs, CA

## **PROFESSIONAL SERVICE ACTIVITIES**

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### **Animal Welfare Advising**

Animal Welfare Council, Sysco Corp., Houston, TX (2018 – Present)

Expert Panel, Global Coalition for Animal Welfare (GCAW), Chichester, UK (2018 – Present)

Animal Observation Sampling Task Force, Farmers Assuring Responsible Management (FARM), National Milk Producers Federation, Washington, DC (2018 – Present)



**Reviewer**

USDA-NIFA-AFRI grant review panel for program area A1251 – Animal Well-Being, FY2018

Journals: *Animal*, *Animal Welfare*, *Applied Animal Behaviour Science*, *Behavioural Processes*, *Current Zoology*, *International Journal of Biometeorology*, *Journal of Animal Science*, *Journal of Dairy Research*, *Journal of Dairy Science*

**International Society for Applied Ethology**, Edinburgh, UK.

Council: Communications Officer (2016 – 2020)

Judge: Graduate student poster competition (2018)

**Department of Dairy Science**, UW-Madison

Graduate Curriculum Committee (2018 – Present)

Dairy Science and Animal Sciences department merger task force (2018 – Present)

Search and screen committee, PVL-94228 Blaine Dairy Unit Manager (2018 – Present)

**Animal Behavior Graduate Group**, UC Davis

Advising committee: Peer academic advisor (2013 – 2015)

Interscholastic Regional Animal Behavior Student Conference: Co-organizer (2012 – 2013)

Seminar committee (2011 – 2012)

**Department of Animal Science**, UC Davis

Picnic Day committee (annual campus-wide public outreach event; 2013 – 2015)

Seminar committee (2011 – 2012)

**SOCIETY AFFILIATIONS**

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American Dairy Science Association (since 2012)

International Society for Applied Ethology (since 2011)

USDA-NC1029: Applied Animal Behavior and Welfare (since 2018)

USDA-W3173: Impacts of Stress Factors on Performance, Health, and Well-Being of Farm Animals (since 2018)

American Association for the Advancement of Science (2014 – 2017)

Phi Beta Kappa honor society (since 2004)

Phi Sigma biological sciences honor society (since 2011)

January 24, 2019