

## Hongwei Xin, Ph.D.

Assistant Dean for Research, College of Agriculture and Life Sciences  
Director of Egg Industry Center, Iowa Egg Council Endowed Professor  
Charles F. Curtiss Distinguished Professor of Ag & Biosystems Engineering and Animal Science  
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Citation Indices: <http://scholar.google.com/citations?user=I02uQPAAAAAJ&hl=en>

### EDUCATION

Ph.D.	Engineering (Bio-environmental Engineering Field), University of Nebraska (Dissertation Advisor: Dr. James A. DeShazer)	1989
M.S.	Agricultural Engineering, University of Nebraska (Thesis Advisor: Dr. James A. DeShazer)	1985
B.S.	Agricultural Engineering, Shenyang Agricultural University, China	1982

### ACADEMIC APPOINTMENTS

2017–present	Assistant Dean for Research, College of Agriculture and Life Sciences, ISU
2017–2018	Interim Director, Iowa Nutrient Research Center, CALS, ISU
2014–present	Charles F. Curtiss Distinguished Professor, ISU
2013–present	Iowa Egg Council Endowed Professor, ISU
2011–2013	Associate Chair for Research of Agricultural and Biosystems Engineering, ISU
2008–present	Director, Egg Industry Center located at ISU
2002–present	Professor, Department of Agricultural and Biosystems Engineering, ISU
2002–present	Professor, courtesy appointment of Animal Science, ISU
1998–2002	Associate Professor, Department of Agricultural and Biosystems Engineering, ISU
1993–1998	Assistant Professor, Department of Agricultural and Biosystems Engineering, ISU
1990–1993	Post-doctoral Research Associate, Dept. of Biological and Agricultural Engineering, University of Arkansas, Fayetteville, Arkansas
1990–1990	Post-doctoral Research Associate, Dept. of Biological Systems Engineering, University of Nebraska-Lincoln (UNL), Lincoln, Nebraska
1984–1989	MS and PhD Graduate Research Assistant, Dept. of Agricultural Engineering, UNL
1982–1983	Instructor, Dep. of Agricultural Engineering, Shenyang Agricultural University, China

### ADMINISTRATIVE/LEADERSHIP EXPERIENCE AND ACCOMPLISHMENTS

- 1) Assistant Dean for Research, CALS (April 2017–present). As a member of the Dean’s Leadership Team, Dr. Xin works with the Dean and Senior Associate Dean in providing the direction and support for the research enterprise of the College; facilitates linkages between the College and Experiment Station research and economic development; and supports international academic partnerships. A few examples of the leadership responsibilities and accomplishments are listed below.
  - Providing leadership in planning and coordinating for the new state-of-the-art ISU Poultry Teaching and Research Facilities (~ 40,000 ft<sup>2</sup> at \$6.05 million private funds plus ~\$500,000 gift-in-kind equipment donations). Working with the ISU Foundation in the fundraising; working with faculty and staff in Animal Science, ABE and Vet Med on planning of the facilities to meet the programmatic needs; working as a liaison between Facility Planning and Management (FPM) and the faculty and staff to ensure that the cost of the facilities fit the budget; working with commercial manufacturers on donations of equipment for the new farm. As an “add-on” project to the construction of the new ISU Poultry Facilities, planning and fundraising (a target of \$1.5 million) on a Turkey Research Facility and support of turkey research is currently in progress (\$1M private funds raised to date). Groundbreaking of the new poultry facility took place August 31, 2018.

- Served as interim director of the Iowa Nutrient Research Center (INRC) (April 1, 2017–Aug. 31, 2018). The INRC was established by the Iowa Board of Regents in response to legislation passed by the Iowa Legislature in 2013 (<https://www.cals.iastate.edu/nutrientcenter>). The center pursues science-based approach to evaluating the performance of current and emerging nutrient management practices, and provides recommendations on implementing the practices and developing new practices for the Iowa Nutrient Reduction Strategy. In this role, Dr. Xin oversaw the operation of the center, assisted by a program coordinator, by proactively interacting with the researchers at the Regents institutions (ISU, University of Iowa, University of Northern Iowa) who received funding from the center, coordinating review/evaluation of research proposals, managing the budget (\$1.3–\$1.6 million/year), convening stakeholders to solicit input on research priorities, coordinating Advisory Council meetings, and updating the state legislators about the center’s programmatic activities and progresses made.
- 2) Director, Egg Industry Center (<https://www.eggindustrycenter.org/>) (2008–present). As inaugural director, Dr. Xin oversees the operation of EIC that is also staffed with a Business Analyst, a Communications Specialist, and a part-time Office Assistant. The EIC’s mission is to add value to the egg industry by facilitating research and learning for egg producers, processors and consumers through national and international collaborations. Routinely works with a 15-member visionary Advisory Board that consists of stakeholders ranging from egg producers, allied industry representatives, government officials, to academic faculty in fulfilling the EIC mission. At its onset, EIC set a goal of establishing a \$10 million endowment to support the research mission. To date, \$6.1 million has been raised (all private funds). Since 2013 EIC has been funding mission-oriented research through a national RFA competition process. As of June 2018, EIC has funded 36 problem-solving projects totaling slightly over \$1 million, involving nine land-grant universities, affecting/touching more than 50 scientists or researchers, leading to ~60 publications, and leveraging more than \$3.5M external funding. Over the past 10 years, EIC has evolved from an unknown entity to a national and even global clearinghouse on egg production.
  - 3) Overseas Chair, Board of Directors, International Research Center for Animal Environment and Welfare (<http://www.ircaew.org/>) (since 2011). Dr. Xin was instrumental in establishing this international center that now consists of 20 member institutions from ten countries (Australia, Belgium, Brazil, Canada, China, Croatia, Denmark, Italy, The Netherlands, USA). In this leadership role, working with a board of diverse technical background and culture, Dr. Xin spearheads organizing the biennial international symposia (2011/2013/2015/2017/2019) and special workshops (2012/2014/2016/2018), which attract leading experts of related disciplines from around the world; and coordinate global academic collaborations. Attendance of the symposia grew from about 50 scientists in 2011 to over 400 in 2015 and 2017. He is serving in second (4-year) term as the Overseas chair of the board.
  - 4) Chair, United Egg Producers Environment Scientific Panel (2004–present). UEP represents over 90% of the U.S. egg producers. The missions of ESP are a) to serve as the clearinghouse for the egg industry regarding environmental issues related to egg production and state of the science on environmental research; and b) to explore practical means and make recommendations on best management practices to improve air quality and environmental stewardship. The 14-member ESP consists of representative from land-grant universities (ISU, Penn State University, Purdue, University of Illinois, The Ohio State University), allied companies, egg producers, and government agency (USDA). During 2008–2010, in partnership with UEP, Dr. Xin successfully led a multi-institutional USDA-CIG project (~\$1M) that demonstrated the use of dietary manipulation to mitigate ammonia emissions and improve manure nutrient values in laying-hen operations. The mitigation strategy has been adopted by egg producers.
  - 5) Associate Chair for Research, ABE (2011–2013). As an integral part of the ABE Leadership Team, Dr. Xin spearheaded the development of key performance indicators (KPI’s) on the department research program; inspired faculty with KPI-based performance data; and worked with faculty to encourage or foster development of large grant proposals. ISU-ABE has been consistently top-ranked nationally among the peers in research expenditures. Today the Department continues using these KPI’s to inspire our faculty to excel in research. Incidentally, AEB ranked #1 nationally in both graduate and undergraduate programs in 2016, and #1 in undergraduate program and #2 in graduate program in 2017 by the U.S. News and World Report.

- 6) Program Director, Midwest Poultry Research Consortium (2008–2013). MPRC involved 12 states and an annual budget of \$450,000 to \$800,000 (appropriated by the U.S. Congress, A.K.A. ear-marked funding). Each year 8-10 proposals were selected for funding through a competitive process. As the program director, Dr. Xin was responsible for managing the overall project budget, communicating with the PI's, and compiling and submitting the project's annual reports. The program was a hallmark of ear-marked-fund-supported research for its significant socio-economic impacts on the poultry industry, training of next-generation scientists, and return of investment.

### LEADERSHIP TRAINING

- 1) Food Systems Leadership Institute (FSLI; <http://www.fsl.org/>), NC State University/The Ohio State University/California State University at St. Luis Obispo (Oct 2018–June 2019).
- 2) North Central Region Administrative Management Training Boot Camp, Crowne Plaza Aire, Bloomington, MN (<http://www.nccea.org/nc-admin-boot-camp/>) (June 20-22, 2017).
- 3) Emerging Leaders Academy (ELA) (<https://www.extension.iastate.edu/ela/>), Iowa State University, offered by the Office of the Senior Vice President and Provost (Jan–Dec, 2012).
- 4) Shared Leadership for Institutional Change (SLIC), Iowa State University, funded by the Kellogg Foundation and the Office of the Senior Vice President and Provost (Jan–Oct, 2003).

### RESEARCH/EXTENSION/MENTORING PROGRAMS, OUTPUTS AND IMPACTS

#### Focus areas in animal production systems engineering:

- Air quality;
- Animal-environment interactions;
- Housing systems and environment control; and
- Precision livestock farming (PLF) for sustainable operation

#### Outputs:

- Principal investigator (PI) or Co-PI of over \$23.7 million contracts and grants for research, extension and education;
- Mentor of 36 graduate students (15 MS, 21 PhD), 12 post-docs, 22 visiting professors and scholars, and numerous undergraduate research assistants (2-6 per semester);
- Author/co-author of 192 refereed journal articles, 5 book chapters, 149 invited talks in 16 countries, 93 conference proceedings, 280+ technical papers and presentations, 65 extension publications, and 100+ research project reports; and
- Regularly serving on academic, industry and government scientific advisory boards or task forces at state, national and international levels.

#### Impacts:

- Significant impacts on the U.S. and global animal agriculture in science, policies and practices;
- Contributions to scientific literature and professional practices (e.g., engineering standards);
- Training of future leaders and next-generation scientists and engineers; twenty-six (26) former advisees are now on faculty (assistant to full professor rankings) at U.S. or overseas academic or government research institutions, and three (3) are leaders in U.S. industries;
- Contributions to the fulfillment of ISU's land-grant missions, national and global academic visibility;
- Enhanced public-private partnerships; and
- Cultivated faculty collaborations and teamwork inside ISU and with external peer institutions.

**PROFESSIONAL AND HONOR SOCIETIES**

- American Society of Agricultural and Biological Engineers (ASABE) – *Lifetime Member*
  - Elected to the Grade of Fellow (2008)
- Committees Served & Offices Held:
  - Organizing Committee of the 10<sup>th</sup> International Livestock Environment Symposium (2016–2018)
  - Organizing Committee of the 9<sup>th</sup> International Livestock Environment Symposium (2011–2012)
  - Program Chair of the 8<sup>th</sup> International Livestock Environment Symposium (2006–2008)
  - Structure and Environment (SE) Division Program Chair (2003–2005)
  - Associate Editor of SE Division (1994–2004; 2009–2013)
  - Meetings Council – SE Representative (2003–2005)
  - Publications Council – Member at large (2003–2005)
  - Planning Committee for the 7<sup>th</sup> International Livestock Environment Symposium (2002–2005)
  - Publications Council - SE Representative (1999–2002)
  - P-511 Refereed Publications, SE Liaison (1996–1999)
  - SE-04 Paper Awards (Chair, 1996; Vice Chair, 1995; Secretary, 1994)
  - SE-05 Publication Review (1995–2004)
  - SE-301 Environmental Physiology (Chair, 1996; Vice Chair, 1995; Secretary, 1994)
  - SE-302 Environment of Animal Structures (Chair, 1999; Vice Chair, 1998; Secretary, 1997)
  - SE-404 Swine Housing (member, 1990 - present)
  - SE-405 Poultry Housing (Chair, 2001; Vice Chair, 2000; Secretary, 1999)
  - Vice Chair Membership of the Iowa Section of ASAE (2000–2001)
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
  - Chair of TC 2.2 Handbook Committee (2000–2003)
- Alpha Epsilon Honor Society of Agricultural Engineers
- Association of Overseas Chinese Agricultural, Biological and Food Engineers
  - Vice President (2003-2004)
- Gamma Sigma Delta – The Honor Society of Agriculture
- Poultry Science Association
  - Chair of Animal Welfare Session for the 2016 Annual Meeting in New Orleans, LA
- Sigma Xi Scientific Research Society

**AWARDS AND HONORS**

- The University of Nebraska Biological Systems Engineering 2018 Hall of Fame Inductee (2018)
- Cyrus Hall McCormick-Jerome Increase Case Gold Medal Award of ASABE (2018)
- Iowa Egg Council Partner Award Bestowed to the Egg Industry Center (2018)
- ISU Exemplary Mentor Award for 2017–2018 academic year (2018)
- Iowa State University International Service Award (2017)
- Invited participant of the National Academies of Science, Engineering and Medicine (NASEM) Jamboree Workshop on Science Breakthroughs 2030: *A Strategy for Food and Agricultural Research*, Oct. 2-4, 2017, Irvine, CA, USA
- Featured in “Retaking the Field” Strengthening the Science of Farm and Food Production – *Clearing the air in a cage-free production system* (pp12-13). The Supporters of Agricultural Research (SoAR) Foundation, Volume 2, March 2017.
- Deputy Director of International Experts Committee, National Alliance for Technological Innovation on Animal Manure Resource Management, Ministry of Agriculture, China (2017-2018)
- Henry Giese Structures and Environment Award of ASABE (2016)
- Distinguished Career Award of the Association of Overseas Chinese Agricultural and Biological Engineers (AOCABFE) (2016)

- ISU College of Agriculture and Life Sciences Dean's Citation for Extraordinary Contributions Award (for timely responses to the 2015 high pathogenic avian influenza outbreaks) (2016)
- Gamma Sigma Delta – The Honor Society of Agriculture, Iowa State University Chapter's Extension Award of Merit (2016)
- Founding member of the Global Expert Group on Avian Influenza, International Egg Commission headquartered in London, United Kingdom (2015–)
- Founding member of the Global Roundtable for Sustainable Egg Production, International Egg Commission headquartered in London, United Kingdom (2015–)
- Charles F. Curtiss Distinguished Professor, Iowa State University (2014)
- USPOULTRY 2014 Workhorse of the Year Award (2014) (a total of five recipients from academia since starting of the award in 1962)
- Technical Paper Award by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) (2014)
- Inaugural Iowa Egg Council Endowed Professor (2013–present)
- Appointed by the U.S. Secretary of Agriculture to the USDA Agricultural Air Quality Task Force (AAQTF) (2008–2010, 2011–2013, 2013–2015)
- Iowa State University College of Engineering Superior Extension Award (2012)
- Foreign Member of the Scientific Advisory Committee for the Science and Information Centre for Sustainable Poultry Industry [WING)], Raum, Germany (2012–present)
- Overseas Chair for Board of Directors, International Research Center for Animal Environment and Welfare headquartered at Chongqing Academy of Animal Sciences, China (2012–2016; 2016–2020)
- Member of the Scientific Advisory Committee for the Key Laboratory of Energy Conservation and Waste Management of Agricultural Structures, Ministry of Agriculture, China (2012–2017)
- Member of the Scientific Advisory Committee for the State Key Laboratory in Animal Nutrition (SKLAN), the Chinese Academy of Agricultural Sciences, Beijing, China (2011–2016)
- Member of the Scientific Advisory Committee for the Key Laboratory on Agricultural Structures and Environment, China Agricultural University, Beijing, China (2008–2011, 2011–2015)
- Midwest Poultry Consortium Outstanding Service Award (2011) (Past recipients include Dr. Dennis Casey, Former President of Hy-Line International; Mr. Bob Sparboe, Founder and President of Sparboe Company; the Honorable Tom Harkin, U.S. Senator; the Honorable Tom Latham, U.S. Congressman; Dr. Wendy Wintersteen, former Endowed Dean of ISU College of Agriculture and Life Sciences and now ISU President; Dr. Susan Lamont, ISU Distinguished Professor)
- Educational Materials Award – Certificate of Excellence by the Council for Agricultural Science and Technology for creation of educational material “*Air Issues Associated with Animal Agriculture: A North American Perspective*” (2011)
- Iowa State University Award for Outstanding Achievement in Research (2010)
- ISU CALS Outstanding Achievement in International Agriculture Award (2010)
- Guest Professor, College of Biosystems Engr. & Food Science, Zhejiang University, China (2010–)
- Appeared in the History Channel show “*The Modern Marvels: Eggs*” (First aired Jan 20, 2010)
- President's Citation Award, the American Society of Ag. and Biological Engineers (ASABE) (2009)
- ISU College of Agriculture and Life Sciences Outstanding Research Award (2009)
- Appointment to Director of the Egg Industry Center (2008–present)
- Project Director of the Midwest Poultry Research Program (2008–2013)
- Inducted to Fellow of the American Society of Agricultural and Biological Engineers (2008)
- ISU College of Engineering David R. Boylan Eminent Faculty Research Award (2008)
- Appointment of Adjunct Professor of China Agricultural University, Beijing, China (2008–present)
- Iowa Poultry Association 2007 Industry Person of the Year Award (2007)
- Chair of the United Egg Producers Environmental Scientific Panel on Air Emissions (2004–present)
- Member of the USDA-NRI Air Quality Program Review Panel (2007–2012)

- U.S. Member of Scientific Board for SMART 2006 Conference, Brescia, Italy (2005-2006)
- Honorary Scientist of the Rural Development Administration of the Republic of Korea (2004-2006)
- Member of EPA National Air Emission Study Planning Committee (2003–2004)
- New Holland Young Researcher Award of the ASAE/ASABE (2001)
- Young Member of the Year Award, Mid-Central Section of the ASAE/ASABE (2001)
- Young Engineer of the Year Award, Iowa Section of the ASAE/ASABE (2001)
- Research Award for Foreign Expert, Ministry of Agriculture, Forestry and Fisheries, Japan (2000)
- Featured in the ISU Campaign “Advancing Technology to Become the Best” (2000)
- Invited member of USDA CSREES delegation to China for assessing environmental issues related to intensive animal production (2000)
- ASABE Paper Awards (14)
  - Nine Superior Paper Awards (1997[2], 2000, 2005[2], 2015, 2017, 2018[2]) (top 2.5% articles)
  - Five Honorable Mention Awards (1998, 2001, 2002, 2003, 2009) (top 5% articles)
- Newcomer Engineer of the Year Award, Iowa Section of the ASAE (1997)
- Honorary Professor of the Chinese Academy of Agricultural Sciences (1998)
- Honorary Professor of China Agricultural University (1996)
- ASAE Educational Blue Ribbon Award (1995)
- Invited speaker at 73 conferences/workshops held in the USA (professional societies, animal and food industry stakeholders, land-grant universities, government agencies) and 70 conferences/workshops held overseas (Belgium, Brazil, Canada, China, Columbia, Costa Rica, Denmark, France, Germany, Italy, Japan, Mexico, The Netherlands, Spain, United Kingdom)
- Sigma Xi Scientific Research Society Travel Award (1987)
- University of Nebraska Widaman Trust Distinguished Graduate Student Award (1986)

## PUBLICATIONS AND PRESENTATIONS

Refereed journal articles – **192**; Book chapters – **5**; Conference proceedings – **93**; Technical papers and presentations – **280+**; Extension publications – **65**; Project reports – **100+**; Invited talks – **149** in **16** countries.

### Refereed Journal Articles (In chronological and alphabetical order. \*Xin was the first author’s mentor.)

1. Chai\*, L., Y. Zhao, **H. Xin**, T. Wang, and M.L. Soupir. 2018. Mitigating airborne bacterial emissions from litter of cage-free hen houses by spray of acidic electrolyzed water: A laboratory study. *Biosystems Engineering*, 170:61-71.
2. Chai\*, L., Y. Zhao, **H. Xin**, T. Wang, M. Soupir, and K. Liu. 2018. Mitigating ammonia and PM generations of cage-free henhouse litter with solid additive and liquid spray. *Transactions of the ASABE* 61(1): 287-294. <https://doi.org/10.13031/trans.12481>
3. Dong, R., H. Dong, K. A. Beauchemin, and **H. Xin**. 2018. Evaluation of manure nitrogen excretion models suitable for lactating dairy cows in China. *Transactions of the ASABE* 61(5): 1713-1727
4. Hui, X., B. Li, **H. Xin**, W. Zheng, Z. Shi, X. Yang, and S. Zhao. 2018. New control strategy against temperature sudden-drop in the initial stage of pad cooling process in poultry houses. *International Journal of Agricultural and Biological Engineering* 11 (1): 66-73.
5. Lin, X., R. Zhang, S. Jiang, H.M. El-Mashad, **H. Xin**. 2018. Fan and ventilation rate monitoring of cage free layer 13 houses in California. *Transactions of the ASABE* (accepted)
6. Liu\*, K., **H. Xin**, J. Sekhon, T. Wang. 2018. Effect of fluorescent vs. poultry-specific light-emitting diode lights on production performance and egg quality of W-36 laying hens. *Poultry Science* 97:834-844. <http://dx.doi.org/10.3382/ps/pex371>
7. Liu\*, K., **H. Xin**, T.A. Shepherd, Y. Zhao. 2018. Perch-shape preference and perching behaviors of young laying hens. *Applied Animal Behaviour Science*, 203(2018):34-41. <https://doi.org/10.1016/j.applanim.2018.02.009>

8. Liu\*, K. **H. Xin**, and P. Settar. 2018. Effects of light-emitting diode light v. fluorescent light on growing performance, activity levels and wellbeing of non-beak-trimmed W-36 pullets. *Animal* 12(1):106-115. <http://dx.doi.org/10.1017/S1751731117001240>
9. Oliveira\*, J.L., **H. Xin**, and H. Wu. 2018. Impact of feeder space on laying hen feeding behavior in enriched colony housing. *Animal* <https://doi.org/10.1017/S1751731118001106>
10. Oliveira\*, J.L., **H. Xin**, L. Chai, and S. Millman. 2018. Effects of litter floor access and inclusion of experienced hens in aviary housing on floor eggs, litter condition, air quality, and hen welfare. *Poultry Science* (in press)
11. Su, Y, X. Zhang, **H. Xin**, S. Li, J. Li, R. Zhang, X. Li, J. Li, and J. Bao. 2018. Effects of prior cold stimulation on inflammatory and immune regulation in ileum of cold-stressed broilers. *Poultry Science* <http://dx.doi.org/10.3382/ps/pey308>
12. Zhao\*, Y., L. Chai, B.J. Richardson, and **H. Xin**. 2018. Field Evaluation of an electrostatic air filtration system for reducing incoming particulate matter of a hen house. *Transactions of the ASABE* 61(1):295-304. <https://doi.org/10.13031/trans.12533>
13. Zhou, Y., H. Dong, **H. Xin**, Z. Zhu, W. Huang, and Y. Wang. 2018. Carbon footprint assessment of large-scale pig production systems in Northern China: A case study. *Transactions of the ASABE* 61(3):1121-1131. <https://doi.org/10.13031/trans.12805>
14. Chai\*, L., Y. Zhao, **H. Xin**, T. Wang, M. Soupier, and K. Liu. 2017. Reduction of particulate matter and ammonia by spraying acidic electrolyzed water onto litter of aviary hen houses – a lab-scale study. *Transactions of the ASABE* 60(2): 479-506. <http://doi.org/10.13031/trans.12081>
15. Harmon, J.D., S.J. Hoff, T.J. Baas, Y. Zhao, **H. Xin**, and L.R. Follet. 2017. Evaluation of conditions during weaned pug transport. *Applied Engineering in Agriculture* 33(6): 901-912. <http://doi.org/10.13031/aea.12367> (**Superior Paper Award**)
16. Li\*, L., Y. Zhao, J. Oliveira, W. Verhoijesen, and **H. Xin**. 2017. A UHF RFID system for studying individual feeding and nesting behaviors of group-housed laying hens. *Transactions of the ASABE* 60(4): 1337-1347. <https://doi.org/10.13031/trans.12202> (**Superior Paper Award**)
17. Lin, X., R. Zhang, S. Jiang, H. El-Mashad, and **H. Xin**. 2017. Emissions monitoring of ammonia, carbon dioxide and particulate matters in two Californian cage-free layer houses. *Atmospheric Environment* 152(2017):246-255. <http://dx.doi.org/10.1016/j.atmosenv.2016.12.018>
18. Liu\*, K. and **H. Xin**. 2017. Effects of horizontal distance between perches on perching behavior of Lohmann hens. *Applied Animal Behaviour Science* 194(2017): 54-61. <https://doi.org/10.1016/j.applanim.2017.05.001>
19. Liu\*, K. **H. Xin**, and L. Chai. 2017. Choice between fluorescent and poultry-specific LED lights by pullets and laying hens. *Transactions of the ASABE* 60(6): 2185-2195. <https://doi.org/10.13031/trans.12402>
20. Lu, Y., M. Hayes, J.P. Stinn, T.M. Brown-Brandl, **H. Xin**. 2017. Evaluating ventilation rates based on new heat and moisture production data for swine production. *Transactions of the ASABE* 60(1):237-245. DOI 10.13031/trans.11888
21. Ponciano, P.F., T. Yanagi, Jr., **H. Xin**. 2017. Performance of chicks subjected to thermal challenge. *Pesq. agropec. bras.* 52(2), doi.org/10.1590/s0100-204x2017000200005
22. Shepherd\*, T.A., **H. Xin**, J.P. Stinn, M.D. Hayes, Y. Zhao, and H. Li. 2017. Ammonia and carbon dioxide emissions of three laying-hen housing systems as affected by manure accumulation time. *Transactions of the ASABE* 60(1):229-236. (doi: 10.13031/trans.11860)
23. Wang, Y., H. Dong, Z. Zhu, P.J. Gerber, **H. Xin**, P. Smith, C. Opio, H. Steinfeld, and D. Chadwick. 2017. Mitigating greenhouse gas and ammonia emissions from swine manure management: a system analysis. *Environ. Sci. Technol.* DOI: 10.1021/acs.est.6b06430
24. **Xin, H.** and K. Liu. 2017. Precision livestock farming in egg production. *Animal Frontier* 7(1): 24-31.

25. Chen, H. **H. Xin**, G. Teng, C. Meng, X. Du, T. Mao, and C. Wang. 2016. Cloud-based data management system for automatic real-time data acquisition from large-scale laying-hen farms. *Int J Agric & Biol Eng* 9(4):106-115. doi: 10.3965/j.ijabe.20160904.2488
26. Lao\*, F. T.M. Brown-Brandl, J.P. Stinn, K. Liu, G. Teng, and **H. Xin**. 2016. Automatic recognition of lactating sow behaviors through depth image processing. *Computers and Electronics in Agriculture* 125:56-62. doi.org/10.1016/j.compag.2016.04.026
27. Long\*, H., Y. Zhao, T. Wang, Z. Ning, and **H. Xin**. 2016. Effect of light-emitting diode (LED) vs. fluorescent lighting (FL) on laying hens in aviary hen houses: Part 1 – Operational characteristics of lights and production traits of hens. *Poultry Science* 95(1):1-11. doi.org/10.3382/ps/pev121
28. Long\*, H., Y. Zhao, **H. Xin**, H. Hansen, Z. Ning, and T. Wang. 2016. Effect of light-emitting diode (LED) vs. fluorescent (FL) lighting on laying hens in aviary hen houses: Part 2 – Egg quality, shelf life and lipid composition. *Poultry Sci.* 95(1):115-124. doi.org/10.3382/ps/pev306
29. Ma\*, H., **H. Xin**, Y. Zhao, B. Li, T.A. Shepherd, and I. Alvarez. 2016. Assessment of lighting needs by W-36 laying hens via preference test. *Animal* 10(4): 671-680. doi.org/10.1017/S1751731115002384
30. Roberts\*, S.A., **H. Xin**, R. Swestka, M. Yum, and K. Bregendahl. 2016. Spatial variation and sampling strategy of manure nutrients in high-rise laying-hen houses. *J. App. Poult. Res.* doi.org/10.3382/japr/pfw013
31. Zhao\*, Y., D. Zhao, H. Ma, K. Liu, A. Atilgan, **H. Xin**. 2016. Environmental assessment of three egg production systems – Part III: airborne bacteria concentrations and emissions. *Poultry Sci.* 1473-1481. doi.org/10.3382/ps/pew053
32. Zhao\*, Y., **H. Xin**, J.D. Harmon, and T.J. Baas. 2016. Mortality rate of weaned and feeder pigs as affected by ground transportation conditions. *Transactions of the ASABE* 59(4):943-948. DOI 10.13031/trans.59.11671 (**Superior Paper Award**)
33. Hansen, H., T. Wang, D. Dolde, and **H. Xin**. 2015. Tocopherol and annatto tocotrienols distribution in laying-hen body. *Poultry Sci.* 94(10):2421-2433. doi.org/10.3382/ps/pev228
34. Hansen, H., T. Wang, D. Dolde, **H. Xin**, and K. Prusa. 2015. Supplementation of laying-hen feed with annatto tocotrienols and impact of  $\alpha$ -tocopherol on tocotrienol transfer to egg yolk. *J. Agric. Food Chem.* 63(9):2537-2544. doi.org/10.1021/jf505536u
35. Karcher, D.M., D.R. Jones, Z. Abdo, Y. Zhao, T.A. Shepherd, and **H. Xin**. 2015. Impact of commercial housing system and nutrition and energy intake on laying hen performance and egg quality parameters. *Poultry Science* 94(3):485-501.
36. Li, H., C. Zhang and **H. Xin**. 2015. Performance of an infrared photoacoustic single gas analyzer in measuring ammonia from poultry houses. *Applied Engineering in Agriculture* 31(3):471-477.
37. Shepherd\*, T.A., Y. Zhao, H. Li, J.P. Stinn, M.D. Hayes, and **H. Xin**. 2015. Environmental assessment of three laying-hen housing systems– Part II: ammonia, greenhouse gas, and particulate matter emissions. *Poultry Science* 94(3):534-543.
38. Wang, Y, H. Dong, Z. Zhu, L. Li, T. Zhou, B. Jiang, **H. Xin**. 2015. CH<sub>4</sub>, NH<sub>3</sub>, N<sub>2</sub>O and NO emissions from stored biogas digester effluent of pig manure at different temperatures. *Agriculture, Ecosystems & Environment* doi:10.1016/j.agee.2015.10.020
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83. Han\*, T. and **H. Xin**. 1997. Performance and energetics of neonatal chicks as influenced by intermittent "in-transit" lighting regimens. Proc. of the 5<sup>th</sup> International Livestock Environment Symposium, May 29-31, 1997, Minneapolis, MN, pp948-953.
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86. Shao\*, J., **H. Xin**, and J.D. Harmon. 1997. Image analysis of swine behavior to determine their thermal comfort. Proc. of the 5<sup>th</sup> International Livestock Environment Symposium, May 29-31, 1997, Minneapolis, MN, pp468-475.
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91. Harmon, J.D., R. Zhang, and **H. Xin**. 1994. Human health concerns in livestock and poultry housing. In: Proc. of 1994 National Poultry Waste Management Symposium held at Atlanta, Georgia, (Eds) P.H. Patterson and J.B. Blake, pp31-42.
92. DeShazer, J.A., M.J. Milanuk, D.L. Watt, **H. Xin**, B. Vansteelant, and R.C. Ewan. 1988. NCCISWINE: The environment and housing component. In: Proc. of the 3<sup>rd</sup> International Livestock Environment Symposium, May 25-27, 1988, Toronto, ON, Canada, pp203-210.
93. **Xin, H.**, J.A. DeShazer, and D.W. Leger. 1988. Swine vocalization under selected husbandry practices. In: Proc. of the 3<sup>rd</sup> International Livestock Environment Symposium, May 25-27, 1988, Toronto, Ontario, Canada, pp336-342.

#### Invited Articles, Lectures, and Presentations

1. **Xin, H.** and M. Ibarburu. 2018. Evolution of the U.S. egg industry. An invited presentation at the 13<sup>th</sup> Rendez-vous avicole AQINAC (Annual Poultry Conference), Nov. 14, 2018, The Saint-Hyacinthe Convention Centre, Quebec, Canada
2. **Xin, H.** 2018. Automated measurements of farm animal physiological and behavioral responses. An invited presentation at the 4<sup>th</sup> International Workshop on Precision Animal Environmental Control, Nov. 6-8, 2018, UNICAMP, Campinas, Brazil
3. **Xin, H.**, Y. Zhao, and L. Chai, 2018. Field evaluation of an electrostatic air filtration system for reducing incoming PM of a henhouse. An invited presentation at the 4<sup>th</sup> International Workshop on Precision Animal Environmental Control, Nov. 6-8, 2018, UNICAMP, Campinas, Brazil
4. Xin, H. 2018. Cage-free research update. An invited presentation at the Iowa Poultry Association Fall Festival Educational Session, Sept 20, 2018, West Des Moines Marriott Hotel, Iowa, USA
5. **Xin, H.** 2018. Cage-free research update. An invited presentation at the Iowa Poultry Association Fall Festival Educational Session, Sept 20, 2018, West Des Moines Marriott Hotel, Iowa, USA

6. **Xin, H.** 2018. The changing egg industry. An invited presentation at the National Symposium on Animal Environment and Precision Animal Husbandry held at Northeast Agricultural University, Sept 3-5, 2018, Harbin, China.
7. **Xin, H.** 2018. The U.S. egg industry. An invited lecture to the Chongqing Academy of Animal Sciences, July 16, 2018, Rongchang, Chongqing, China.
8. **Xin, H.** 2018. Poultry housing and environment control. An invited lecture to the Chongqing Academy of Animal Sciences, July 16, 2018, Rongchang, Chongqing, China.
9. Current and emerging issues facing the U.S. egg industry. An invited presentation to the American Egg Board Food Technology Advisory Council, AEB Headquarters Office, May 9-10, 2018, Chicago, IL, USA.
10. **Xin, H., J. Oliveira, D. Eckard, and C. Rowles.** 2018. Field findings of partial vs. full litter access in aviary hen housing. An invited presentation at the 10<sup>th</sup> Anniversary Egg Industry Issues Forum, April 17-18, 2018; Scottsdale, AZ, USA
11. **Xin, H.** 2018. The Egg Industry Center – *Research Update*. An invited presentation at the Egg Farmers of Canada 53<sup>rd</sup> Annual Meeting, March 27-28, 2018, Niagara Falls, ON, Canada.
12. **Xin, H.** 2018. Impact of partial vs. full litter access in aviary hen housing. An invited presentation at Joint Meeting of the United Egg Producers Scientific Advisory Committee and UEP Producers Animal Welfare Committee, Jan 31, 2018, The Westin Hotel, Atlanta, GA, USA
13. **Xin, H.** 2017. American egg industry at a crossroad. An invited presentation at the Foundation for Agricultural Research (FFAR) Sustainable Livestock Production Convening Event, Dec. 4, 2017, The National Academies Building, Washington, D.C., USA
14. **Xin, H.** 2017. Ventilation for broiler and layer housing. An invited presentation at the Third International Workshop on Precision Animal Environment Control, November 6-9, 2017; UNICAMP, Campinas, Brazil.
15. **Xin, H.** 2017. Behavioral and performance responses of pullets and layers to fluorescent and poultry-specific LED lighting. An invited presentation at the Third International Workshop on Precision Animal Environment Control, November 6-9, 2017; UNICAMP, Campinas, Brazil.
16. **Xin, H.** 2017. Technology will advance animal wellbeing. An invited presentation at the 7<sup>th</sup> Annual Symposium on Current Issues and Advances in Food Animal, August 3, 2017, University of Arkansas, Fayetteville, AR, USA.
17. **Xin, H.** 2017. Animal welfare and egg production sustainability. An invited keynote presentation at the 54<sup>th</sup> Brazilian Society of Animal Science Annual Meeting, July 24-28, 2017, Foz de Iguacu, Brazil
18. **Xin, H.** 2017. Towards precision livestock farming. An invited presentation to the Plant Animal Facility Systems Distinguished Lecture at the 2017 ASABE Annual International Meeting, July 16-19, 2017, Spokane, WA, USA
19. **Xin, H.** 2017. American egg industry at a crossroads. An invited presentation at the 2017 Urban Ag Academy Conference, The Gateway Hotel and Conference Center, July 13, 2017, Ames, IA, USA
20. **Xin, H.** 2017. Housing and environment control for egg production. An invited presentation at the 2017 Hy-Line International Technical School, West Des Moines Sheraton Hotel, June 12-15, 2017, West Des Moines, IA, USA
21. **Xin, H.** 2017. Direction of cage-free egg production. An invited presentation to the American Egg Board Food Technology Advisory Council meeting, May 10-11, 2017, Chicago, IL, USA
22. Lawrence, J.D., **H. Xin,** and M. Ibarburu. 2017. Economic impact of HPAI outbreak in Iowa. An invited presentation at the USDA-APHIS Field Reimbursement Specialists Training Workshop, March 23, 2017, National Animal Disease Center, Ames, IA, USA (Xin delivered the talk).
23. **Xin, H.** and Y. Zhao. 2017. Ventilation shutdown to control HPAI disease spread. An invited presentation at the USDA-APHIS Field Reimbursement Specialists Training Workshop, March 23, 2017, National Animal Disease Center, Ames, IA, USA.



24. **Xin, H.** 2017. A holistic evaluation of three egg production systems—*conventional cage, enriched colony and aviary cage-free*. A plenary presentation at the 10<sup>th</sup> International Congress of AVEM 2017, March 7-9, 2017, Queretaro, Mexico.
25. **Xin, H., K. Liu, H. Ma, and P. Settar.** 2017. Behavioral and production responses of pullets and layers to LED vs. CFL light. A plenary presentation at the 10<sup>th</sup> International Congress of AVEM 2017, March 7-9, 2017, Queretaro, Mexico.
26. **Xin, H., Y. Zhao, E. Takle, D. Schmitt, and L. Chai.** 2017. Measure, model and mitigate airborne transmission of avian influenza virus. A plenary presentation at the 10<sup>th</sup> International Congress of AVEM 2016, March 7-9, 2017, Queretaro, Mexico.
27. **Xin, H.** 2017. An overview of the egg industry evolution. An invited presentation at the USDA Agricultural Outlook Forum “A New Horizon”, Feb. 23-24, 2017, Washington D.C., USA
28. **Xin, H.** 2016. Poultry housing systems. A lecture presentation to the TSM 327 class, Nov. 28, 2016, Ames, IA, USA
29. **Xin, H.** 2016. Egg production systems: *pros and cons*. An invited presentation at the SusAg Graduate Program Colloquium, Nov. 16, 2016, Ames, IA, USA
30. **Xin, H.** 2016. Laying hen housing systems: *pros and cons*. An invited presentation at the Second International Workshop on Precision Environment Control, Nov. 7-11, 2016, UNICAMP, Brazil.
31. **Xin, H.** 2016. Measure, model and mitigate airborne transmission of avian influenza virus. An invited seminar at Wageningen University, Oct. 21, 2016, Wageningen, The Netherlands.
32. **Xin, H.** 2016. Poultry production systems: Part II – laying hens. A guest lecture presentation to the AnSci223 class, Oct. 5, 2016, Ames, IA, USA.
33. **Xin, H.** 2016. Poultry production systems: Part I – meat birds. A guest lecture presentation to the AnSci223 class, Oct. 3, 2016, Ames, IA, USA.
34. **Xin, H.** 2016. Developing trend of global layer industry. A plenary presentation at the 25<sup>th</sup> World Poultry Congress (WPC2016) – Symposium on Egg Production, Sept. 6-9, 2016, Beijing, China.
35. **Xin, H.** 2016. Environmental challenges and opportunities with cage-free hen housing system, an invited presentation at the 25<sup>th</sup> World Poultry Congress, Sept. 6-9, 2016, Beijing, China.
36. **Xin, H.** 2016. Trade-offs of different hen housing systems. A presentation at an Industry Forum on Egg Production Systems hosted by Beijing DQY Company, Sept. 24, 2016, Beijing, China.
37. **Stinn, J.P. and H. Xin.** 2016. Heat and moisture production rates of a modern U.S. swine breeding-gestation-farrowing facility. An invited presentation at the Plant, Animal and Facility Systems Distinguished Lecture Series held during the ASABE 2016 Annual International Meeting, July 17-20, 2016; Orlando, FL, USA.
38. **Xin, H., M. Ibarburu, and L. Vold.** 2016. The US egg industry during and after 2015 HPAI outbreak. An invited presentation at the NE-1442 multi-state project meeting, August 8-11, 2016, University of Bern, Switzerland.
39. **Xin, H.** 2016. Automated measurements of farm animal behavioral and physiological responses. A presentation at the First International Symposium on Environment Control for Sustainable Animal Production, June 7-10, 2016, Federal University of Viçosa, Brazil.
40. **Xin, H. and M. Ibarburu.** 2016. The U.S. egg industry after 2015 HPAI outbreak. A presentation to the American Egg Board Food Technology Advisory Council, May 5, 2016, Chicago, IL, USA
41. **Xin, H., Y. Sato, and A. Wolc.** State of the science on HPAI research. A presentation at the 2016 Egg Industry Center’s Annual Egg Industry Issues Forum, April 20-21, 2016, Chicago, IL, USA
42. **Xin, H. and Y. Zhao.** 2016. HPAI studies and ventilation shutdown. A presentation to Joint State and Federal Field Veterinarian Staff, March 30, 2016, Des Moines, IA, USA.
43. **Xin, H.** 2016. Poultry housing systems. A guest lecture presentation to the AnSci223 class, March 23, 2016, Ames, IA, USA.
44. **Xin, H.** 2016. Hen housing systems and 2015 HPAI in the US. A plenary presentation at the Annual Meeting of the National Pasta Association, March 14-15, 2016, Naples, Florida, USA
45. **Xin, H.** 2016. Update on HPAI research. A presentation to the Industry Program Committee at the American Egg Board Meeting, March 10-11, 2016, Napa, California, USA

46. **Xin, H.** 2016. Environment and egg production. A keynote presentation at the 9<sup>th</sup> International Congress of AVEM2016, February 24-25, 2016, Queretaro, Mexico.
47. **Xin, H.** 2016. The 2015 HPAI outbreaks in the United States. A presentation to international delegations visiting Hy-Line International, Jan 22, 2016, West Des Moines, Iowa, USA
48. **Xin, H.** and M. Ibarburu. 2016. U.S. egg industry, statistics and prices. A presentation to international delegations visiting Hy-Line Int'l, Jan 22, 2016, West Des Moines, Iowa, USA
49. **Xin, H.,** Y. Zhao and E.S. Takle. 2015. Assessing potential airborne transmission of HPAI virus in Iowa. An invited presentation at the Iowa Turkey Federation 2015 Annual Convention held 9 December 2015, West Des Moines Marriott Hotel, Iowa, USA
50. **Xin, H.** 2015. U.S. poultry production systems. A guest lecture presentation to the TSM327 class, Nov. 4, 2015, Ames, IA, USA.
51. **Xin, H.** 2015. Environmental control technologies for livestock production. An invited presentation at the Workshop on Comprehensive Nutrient Management Plan held Oct. 26-27, 2015, Zhangye City, Gansu Province, China.
52. **Xin, H.** and Y. Zhao. 2015. Modeling of ventilation shutdown of layer houses. An invited presentation at the Iowa Egg Industry Symposium, 1 October, 2015, Ames, Iowa, USA
53. **Xin, H.** and Y. Zhao. 2015. Modeling of ventilation shutdown of layer houses. A keynote presentation at the International Egg Commission 2015 Global Leadership Conference, Sept 20-24, 2015, Berlin, Germany.
54. **Xin, H.** 2015. U.S. poultry production systems. A guest lecture presentation to the SusAg515 class, Sept. 1, 2015, Ames, IA, USA.
55. **Xin, H.** 2015. Comprehensive Nutrient Management Plan (CNMP) – *Air Quality*. A presentation at the CNMP Training Workshop held at the Chinese Academy of Agricultural Sciences, March 24-25, 2015; Beijing, China.
56. **Xin, H.** 2015. State of the U.S. egg industry. A graduate seminar presentation at the Chinese Academy of Agricultural Sciences, March 25, 2015, Beijing, China.
57. **Xin, H.** 2015. Managing air in poultry housing. An invited presentation at the Annual Atlantic Poultry Conference, February 11-13, 2015, Greenwich, Nova Scotia, Canada.
58. **Xin, H.** 2015. Advancement of the U.S. egg industry over the past 50 years. An invited presentation at the US Poultry Animal Agriculture Sustainability Summit, January 27, 2015; Atlanta, GA, USA.
59. **Xin, H.** 2015. State of the U.S. egg industry. An invited presentation at the Ames Morning Rotary Club, January 21, 2015; Ames, Iowa, USA.
60. **Xin, H.** 2014. Environmental impact of three laying-hen housing systems. An invited presentation at the 2014 Fall ABE Extension In-service Training, September 24, 2014; Iowa State University, Ames, Iowa, USA.
61. **Xin, H.** 2014. Research on animal environment and behavior. An invited presentation at the Workshop on Animal Environment and Welfare held Sept 13-14, 2014, Harbin, China.
62. **Xin, H.** 2014. Monitoring air emissions of animal production systems. A keynote presentation at an International Symposium on Animal Manure Management and Environmental Control sponsored by the Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Science, June 27-28, 2014, Beijing, China.
63. **Xin, H.** 2014. Environmental control for egg production. A keynote presentation at the Hy-Line International Bi-annual Technical School, June 9-13, 2014; Sheraton Hotel, West Des Moines, Iowa, USA (~120 international attendees).
64. **Xin, H.** 2014. Egg production and energy use. 2014. A webinar presentation to the USDA-NRCS On-Farm Energy Quality Assurance Program, April 23, 2014.
65. **Xin, H.,** N. Pelletier, M. Ibarburu. 2014. U.S. egg industry environmental footprint in 1960 and 2010. Presentation to the “Think Tank on Animal Agriculture” Meeting, April 21, 2014; Ames, Iowa, USA.

66. **Xin, H.**, N. Pelletier, M. Ibarburu. 2014. U.S. egg industry environmental footprint in 1960 and 2010. Presentation at the 49<sup>th</sup> Egg Farmer of Ontario Annual Conference, March 25, 2014; Toronto, Canada.
67. **Xin, H.**, N. Pelletier, M. Ibarburu. 2014. Comparison of the U.S. egg industry environmental footprint in 1960 and 2010. Keynote speech at the Symposium on Poultry Industry Sustainability organized by the Science and Information Centre for Sustainable Poultry Industry [Wissenschafts- und Informationszentrum Nachhaltige Geflügelwirtschaft (WING)], February 27, 2014; Vechta, Germany.
68. **Xin, H.**, M. Ibarburu, and N. Pelletier. 2014. What can we learn from the observed improvement in the U.S. egg industry's environmental footprint? A keynote speech at the IPPE Symposium "Egg and the World Food Challenges", Jan 29, 2014; Atlanta, GA, USA.
69. **Xin, H.** 2013. Swine environmental control and mortality disposal options. An invited presentation for the China Ministry of Agriculture Training Workshop on Swine Production, December 19-21, 2013; Beijing, China.
70. **Xin, H.** 2013. An overview of U.S. poultry housing systems. A lecture to TSM327 class, November 18, 2013; Iowa State University, Ames, IA, USA.
71. **Xin, H.** 2013. Environmental control for poultry production. An invited seminar presentation in the College of Animal Science at Agricultural University of Hebei, October 23, 2013; Baoding, Hebei, China.
72. **Xin, H.**, M.D. Hayes, Y. Zhao, M. Ibarburu, S. Millman. 2013. On aviary hen housing. An invited plenary presentation at the International Symposium on Animal Environment and Welfare, Oct 20-22, 2013; Rongchang, Chongqing, China.
73. **Xin, H.** 2013. Environmental footprint of the U.S. egg industry. A plenary presentation at the United Egg Producers Annual Meeting, Oct 9-11, 2013, Ashville, NC, USA.
74. **Xin, H.** 2013. U.S. egg industry and the Egg Industry Center. A guest lecture to AnSci 501 (Graduate Seminar), Sept 30, 2013; Iowa State University, Ames, IA, USA.
75. **Xin, H.** 2013. Environmental control for poultry production. An invited plenary presentation at the 16<sup>th</sup> China National Poultry Science Symposium, May 13-15, 2013; Yangzhou, China.
76. **Xin, H.** 2013. Systems and protocols for monitoring AFO air emissions. An invited presentation at the Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, May 21, 2013; Beijing, China.
77. **Xin, H.** and J. P. Stinn. 2013. Gaseous emissions, heat and moisture production, and heat mat vs. heat lamp comparison in a modern breeding, gestation and farrowing swine facility. An invited presentation at the Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, May 21, 2013; Beijing, China.
78. **Xin, H.**, N. Pelletier, M. Ibarburu. 2013. Dramatic advancement of the U.S. egg industry over the past 50 years. An invited presentation at the 2013 Egg Industry Center Annual Egg Industry Issues Forum, April 16-17, 2013, St. Louis, MO, USA.
79. **Xin, H.** 2013. Animal heat exchange pathways and cooling options. An invited presentation at the Heat Stress Symposium held at Iowa State University, April 4-5, 2013, Ames, Iowa, USA
80. **Xin, H.** 2013. Environmental impact of three hen housing systems. An invited presentation at the Midwest Poultry Federation Convention Educational Session – Simmering Issues, March 14, 2013, St Paul, MN, USA.
81. **Xin, H.** 2013. Advancement of U.S. egg industry over the past 50 years. An invited presentation at the Chinese Academy of Agricultural Science – Institute of Animal Science, Jan 22, 2013, Beijing, China.
82. **Xin, H.** 2013. Environmental footprint of the egg – Dramatic progress over the past 50 years. An invited presentation at the Future of U.S. Egg Industry Symposium held during the International Poultry Expo, Jan 31, 2013, Atlanta, GA, USA.
83. **Xin, H.** 2012. State and R&D opportunities of U.S. egg industry and the role of Egg Industry Center. A keynote presentation at the Joint Conference of Chinese Association of Animal Science

- and Veterinary Medicine and Chinese Society of Agricultural Engineers on Eco-environment and Sustainable Livestock Production, Nov 2-5, 2012, Beijing, China.
84. **Xin, H.** 2012. Fundamentals of thermal environment and animal responses. A lecture to the graduate-level class “Environmental Physiology”, Nov 6, 2012, China Agricultural University, Beijing, China.
  85. **Xin, H.** 2012. Animal indirect calorimeter – theory and applications. A lecture to the graduate-level class “Environmental Physiology”, Nov 6, 2012, CAU, Beijing, China.
  86. **Xin, H.** 2012. Animal housing ventilation systems and management. A lecture to the graduate-level class “Environmental Physiology”, Nov 7, 2012, CAU, Beijing, China.
  87. **Xin, H.** 2012. An overview of U.S. poultry production systems. A presentation to the National Graduate Training Workshop, Nov 7, 2012, China Agricultural University, Beijing, China.
  88. **Xin, H.** 2012. An overview of U.S. poultry production systems. A presentation to the National Graduate Training Workshop, Nov 7, 2012, China Agricultural University, Beijing, China.
  89. **Xin, H.** 2012. A Comprehensive assessment of aviary laying-hen housing system in the Midwest. A presentation at the Iowa Poultry Association Fall Festival Educational Session, Sept 20, 2012, Okoboji, Iowa, USA.
  90. **Xin, H., N. Pelletier, and M. Ibarburu.** 2012. Environmental footprint of the egg – dramatic progress over the past 50 years. A keynote presentation at the International Egg Commission 2012 London Conference, Sept 10-13, 2012, London, United Kingdom.
  91. **Xin, H.** 2012. Trend and R&D opportunities of laying-hen housing systems. An invited keynote presentation at the XXIV World Poultry Congress, August 5-10, 2012, Salvador, Brazil.
  92. **Xin, H.** 2012. An exciting time for China – US collaborations in sustainable agriculture. An invited keynote presentation at the China Exchange Session of the ASABE Annual International Meeting, July 29 – Aug 1, 2012, Dallas, Texas, USA
  93. **Xin, H.** 2012. Toward standardization of data collection, analysis and presentation of AFO air emissions. An invited keynote presentation at the Ninth International Livestock Environment Symposium, July 9-12, 2012, Valencia, Spain.
  94. **Xin, H.** 2012. Environmental management of laying-hen houses to improve egg Production. An invited presentation at the Hy-Line International Technical School, July 16-19, 2012, West Des Moines, Iowa, USA.
  95. **Xin, H.** 2012. U.S. Egg Industry and the Egg Industry Center. A presentation to graduate students and faculty at the Agricultural University of Hebei, June 15, 2012, Baoding, China.
  96. **Xin, H.** and M. Ibarburu. 2012. Toward sustainable development of egg industry and the role of Egg Industry Center. An invited presentation at the International Symposium on Egg Industry, June 18-19, 2012, Beijing, China.
  97. **Xin, H.** 2012. A holistic view of egg production systems and implications for the US pasta industry. An invited presentation at the National Pasta Association Annual Meeting, March 26-27, 2012, Naples, FL, USA
  98. **Xin, H.** 2011. A balanced approach to animal welfare issues to avoid unintended consequences. A keynote speech at the International Symposium on Health Environment and Animal Welfare, Oct 20-22, 2011; Rongchang/Chongqing, Sichuan Province, China.
  99. **Xin, H.** 2011. Measurement and mitigation of air emissions from animal production facilities. An invited presentation for the Ensminger Outreach Program held on Oct 16, 2011 at the Institute of Animal Science, the Chinese Academy of Agricultural Sciences, Beijing, China.
  100. **Xin, H.** 2011. Measurement and mitigation of air emissions from animal production facilities. An invited presentation for the Ensminger Outreach Program held on Oct 18, 2011 at Huanzhong Agricultural University, Wuhan, Hubei Province, China
  101. **Xin, H.** 2011. U.S. egg industry and the Egg Industry Center. An invited presentation at the Anhui Academy of Agricultural Sciences, Oct 26, 2011, Hefei, Anhui Province, China
  102. **Xin, H.** 2011. An overview of precision livestock farming. An invited presentation at the Chinese Academy of Agricultural Sciences – Feed Research Institute, Aug 2-3, 2011, Beijing China.

103. **Xin, H.** and R.T. Burns. 2011. Swine deep-pit barn fires: Understanding the causes. A presentation to the Agribusiness Association of Iowa Feed and Livestock Committee, July 20, 2011, Des Moines, Iowa, USA
104. **Xin, H.** 2011. Managing temperature and ventilation in fully automated hen houses to optimize egg production, Hy-Line International Technical Service Workshops, June 12-17, 2011, Columbia (Bogota, Cali and Bucaramanga, a total of about 450 people in attendance),
105. **Xin, H.** 2011. Ammonia emissions from poultry operations. Ammonia Emissions and Nitrogen Conservation Workshop organized by the Ohio State University Extension, May 1-2, 2011, Nationwide and Ohio Farm Bureau 4-H Center, Columbus, OH, USA
106. **Xin, H.** 2011. Overview of ammonia mitigation BMPs and BATs. Ammonia Emissions and Nitrogen Conservation Workshop organized by the Ohio State University Extension, May 1-2, 2011, Nationwide and Ohio Farm Bureau 4-H Center, Columbus, OH, USA
107. Pelletier, N., Ibarburu, M. and **H. Xin.** 2011. A life cycle assessment of supply chain greenhouse gas emissions for egg production and processing in Iowa. A presentation at the Third Annual Egg Industry Issues Forum, April 7, 2011, Columbus, OH, USA
108. **Xin, H.** 2011. U.S. egg industry and the Egg Industry Center. A Seminar for the ISU Veterinary Medicine Theriogenology Club, April 4, 2011, Ames, Iowa, USA
109. **Xin, H.** 2011. U.S. egg industry and the Egg Industry Center. A Seminar for the ISU AnSci Meat Science Class, March 2, 2011, Ames, Iowa, USA
110. **Xin, H.** 2011. Update of the Egg Industry Center and related program. Nebraska Poultry Industry Convention, Feb 23-25, 2011, Columbus, NE, USA
111. **Xin, H.** 2011. U.S. egg industry and the Egg Industry Center. A Seminar for the ISU Food Science Department, February 2, 2011, Ames, Iowa, USA
112. **Xin, H.** 2011. A holistic approach to assessing laying-hen production systems. ISU and University of Nebraska joint training in animal welfare, Jan 5-6, 2011, Ames, Iowa, USA
113. **Xin, H.** 2010. The past, present and future of U.S. egg industry. Presented at the Second Sino-US Workshop on Egg Production and Environmental Control, Oct 10-12, 2010, Shanghai, China
114. **Xin, H.** 2010. How to produce high-quality SCI journal articles. Presented at the Feed Research Institute of the Chinese Academy of Agricultural Sciences, Oct 14, 2010, Beijing, China
115. **Xin, H.** 2009. Cooling poultry in hot climates. Presented at the International Workshop on “*Animal Housing in Hot Climates*” organized by the CIGR Section II Working Group, Oct 22-25, 2009, Rongchang, Sichuan, China
116. **Xin, H.** 2009. Overview of air emission mitigation options for animal feeding operations. A special presentation to the USDA Agricultural Air Quality Task Force, September 17, 2009, Des Moines, Iowa, USA
117. **Xin, H.** 2009. U.S. egg production, environmental control and housing systems for egg production. Plenary presentation at the Sino-US Workshop on Egg Production, July 17, 2009, China Agricultural University, Beijing, China
118. **Xin, H.** 2009. Mitigating ammonia emissions from laying-hen houses through dietary manipulation. Plenary presentation at the Egg Industry Issues Forum sponsored by the Egg Industry Center, April 8, 2009, Des Moines, Iowa, USA
119. **Xin, H.** 2009. Egg Industry Center and Egg Processing Research at Iowa State University. Plenary presentation at the International Egg Commission Annual Conference, March 29-April 1, 2009, London, United Kingdom
120. **Xin, H.** 2009. Cooling poultry in tropical climates. Ensminger International Conference, February 7-14, 2009, San Jose, Costa Rica
121. **Xin, H.** 2008. Overview of air emission remediation technologies. National Poultry Waste Management Symposium, October 21-23, 2008, Des Moines, IA, USA
122. **Xin, H.** 2008. Turkey air emissions. A presentation at the Iowa Turkey Federation Annual Turkey-Day Conference, December 2-4, 2008, Des Moines, IA, USA

123. **Xin, H.** 2008. Quantification and mitigation of air emissions from broiler, turkey and laying hen facilities. Midwest Poultry Federation Convention, March 19-20, 2008, St. Paul, MN, USA
124. **Xin, H.** 2008. Monitoring of air emissions from Midwest turkey barns. National Turkey Federation Annual Convention, February 10-12, 2008, San Diego, CA, USA
125. **Xin, H.** 2007. Improving air quality by managing ammonia and humidity. Pennsylvania Poultry Sales and Service Conference, September 18-20, 2007, Lancaster, PA, USA
126. **Xin, H.** 2007. Ammonia emissions from pullet and layer facilities: Present and future. Poultry Sales and Service Conference, September 18-20, 2007, Lancaster, PA, USA
127. **Xin, H.** 2007. Update on turkey barn air emissions monitoring. Turkey Research Review/APV Symposium, September 27, 2007, Holiday Inn & Convention Center, Willmar, MN, USA
128. **Xin, H.** 2007. State of air emissions for U.S. egg production operations. Invited plenary talk at the International Egg Commission Annual Conference, March 25-27, 2007, London, UK
129. **Xin, H.** 2007. Research update on measurement and mitigation of air emissions from egg operations. Invited talk at the Midwest Poultry Federation Convention, March 13-15, 2007, St Paul, MN, USA
130. **Xin, H.**, H. Li, and R.T. Burns. 2006. Strategies to reduce air emissions in layer facilities. Invited talk at the National Poultry Waste Management Symposium, Oct. 24-25, 2006, Springdale, AR, USA
131. **Xin, H.** 2006. UEP initiative toward mitigating air emissions. Invited talk at the National Poultry Waste Management Symposium, Oct. 24-25, 2006, Springdale, AR, USA
132. **Xin, H.** 2006. Testing for poultry air emissions. Invited talk by U.S. Poultry & Egg Association at the International Poultry Expo Educational Workshop, January 2006, Atlanta, GA, USA
133. Cook, R.N. and **H. Xin.** 2004. Effects of cage stocking density on feeding behaviors of group-housed laying hens. Proc of the Iowa Egg Industry Symposium, pp41-47. Iowa State University, Ames, Iowa, USA
134. **Xin, H.** 2004. Air emissions form egg operations – current state and future needs. Presentation at the United Egg Producers Annual Convention, Oct 20-22, 2004, New Orleans, LA, USA
135. **Xin, H.** 2004. Ammonia emission form laying hen house in Iowa. Presentation to a joint meeting of the United Egg Producers and United Egg Board Executive Committees, Jan 26-27, 2004, Atlanta, GA, USA
136. **Xin, H.** 2002. Quantification of ammonia emissions from U.S. poultry houses. Invited presentation at a special seminar on “Air Pollutants and Noise in Animal Production”, September 10-11, 2002, UNICAMP, Brazil
137. **Xin, H.** 2001. Sino-US collaboration to develop aerosols emission inventory and reduction techniques for concentrated animal feeding operations. In: Proceedings of the Agro-environment and Compost Demonstration – Seminar on Sino-US Collaboration in Agriculture, sponsored by the Department of International Cooperation, MOA, PRC and Foreign Agriculture Service, USDA, Nov. 5-7, 2001, Beijing, China, pp29-32.
138. **Xin, H.**, J.D. Harmon, D.H. Harris, R.C. Ewan, and M.L. Gramer. 1999. Effects of post-weaning nutritional regimens on PIC Isowean pigs. In: Proceedings of the American Association of Swine Practitioners Annual International Conference, Feb 27 – March 3, 1999, Adam’s Mark Hotel, St. Louis, MO, USA
139. **Xin, H.** 1998. Ventilation to control poultry house indoor air quality. An International Symposium on Environment and Air Quality of Poultry Production sponsored by the Brazilian Agricultural Research Corporation – EMBRAPA and Brazilian National Center for Research on Swine and Poultry – CNPSA, Oct. 27-30, 1998, Concordia, Brazil
140. **Xin, H.** 1998. Assessing swine thermal stress via neural network analysis of their behavioral images coupled with thermography. An International Symposium on Recent Advances in Assessing Heat Stress of Domestic Animals sponsored by the American Society of Animal Science (ASAS), July 27-29, 1998, Denver, CO, USA

141. **Xin, H.**, J. Shao, and J. Hu. 1998. Image analysis of swine postural behavior. Measuring Behavior '98 - An International Conference on Measurement of Animal Behavior, held on August 19-22, 1998, Groningen, The Netherlands
142. **Xin, H.** 1997. Too hot or too cold? Ask the pigs. *ASAE Resource magazine* (1): 7-8. (Feature article invited by the ASAE).
143. **Xin, H.** 1997. Lecture series on livestock environment control: principles, state-of-the-art technologies, and case studies. The Chinese Academy of Agricultural Sciences, September 6 - 13, 1997, Beijing, China
144. **Xin, H.** and J. Shao. 1997. Application of machine vision to swine environmental control. IEEE/ASME International Conference on Advanced Intelligent Mechatronics, June 16-20, 1997, Waseda University, Japan
145. **Xin, H.** 1996. Automated data acquisition system for field animal environmental research. The 1<sup>st</sup> International Conference on Agricultural and Biological Environmental Engineering, Aug. 15-19, 1996, Beijing, China
146. **Xin, H.** 1996. Responses of neonatal chicks to post-hatch holding environment. The 1<sup>st</sup> International Conference on Agricultural and Biological Environmental Engineering, Aug. 15-19, 1996, Beijing, China
147. **Xin, H.** 1996. Principles of Poultry House Ventilation. 1996 Iowa Poultry Symposium, March 28, 1996, Scheman Continuing Education Center, Iowa State University, Ames, Iowa, USA
148. **Xin, H.** 1995. A computerized measurement and data acquisition system for field poultry research. The 4<sup>th</sup> Latin America Conference on Agromatics, April 24-28, 1995, the Institute of Technology of Costa Rica, San Carlos, Costa Rica
149. **Xin, H.** 1995. Air transport of day-old chicks. Livestock Export Workshop sponsored by USDA Agricultural Marketing Service, October 24-25, 1995, Ithaca, New York, USA

**National & International Professional Conference Papers/Presentations:** 280+

**Extension Publications and Popular Press Articles Derived from Research**

1. Xin, H. 2016. Opportunities and challenges of going cage-free. An invited "Viewpoint" article to Poultry Times, July 6, 2016. [http://www.poultrytimes.com/poultry\\_today/article\\_1fb7e224-43a6-11e6-b8d7-c7420f870aec.html](http://www.poultrytimes.com/poultry_today/article_1fb7e224-43a6-11e6-b8d7-c7420f870aec.html)
2. Stinn, J.P., T.A. Shepherd, and **H. Xin**. 2014. Optimizing tunnel ventilation systems for summer conditions. A.S. Leaflet-R2895. Animal Industry Report, ISU Extension, Ames, IA.
3. Zhao, Y. and **H. Xin**. 2013. Ammonia concentrations and emissions of aviary hen houses. A.S. Leaflet-R2802. Animal Industry Report, ISU Extension, Ames, IA.
4. Zhao, Y. and **H. Xin**. 2013. Roof insulation in laying-hen houses to ease summer heat stress. A.S. Leaflet-R2803. Animal Industry Report, ISU Extension, Ames, IA.
5. Harmon, J.D., D. Petersen, and **H. Xin**. 2012. Conserving energy by using localized heating in swine housing - Farm Energy. ISU Extension Publication PM 2089V, Ames, Iowa.
6. Jenkins, J.D., R.L. Parsons, M.D. Hayes, **H. Xin**, S. Millman. 2012. Litter use in an aviary laying hen housing system. A.S. Leaflet-R2720. Animal Industry Report, ISU Extension, Ames, IA.
7. **Xin, H.**, H. Li, R.T. Burns, J. Kliebenstein, M. Ibarburu, S.A. Roberts, K. Bregendahl. 2011. Mitigating ammonia emissions from high-rise hen houses through dietary manipulation. A.S. Leaflet 11-67, Animal Industry Report, ISU Extension, Ames, IA.
8. **Xin, H.**, H. Li, R.S. Gates, and R.T. Burns. 2010. Methodologies and protocols for analysis of raw data to minimize uncertainty of resultant emissions estimation. A white paper written for the USDA Agricultural Air Quality Task Force Workshop on Livestock and Poultry Air Emissions Standardization held Sept 27-28, 2010, Raleigh, NC.
9. **Xin, H.**, H. Li, R.T. Burns, S.A. Roberts, S. Li, K. Bregendahl, J. B. Kliebenstein. 2009. Mitigating ammonia emissions from laying-hen houses through dietary manipulation. Proceedings of the Egg Industry Issues Forum hosted by Egg Industry Center, Ames, Iowa, held on April 8, 2009, Des Moines, Iowa, pp48-58.

10. Burns, R.T., R. Swestka, **H. Xin**, et al. 2008. Development of a wireless sensor network to quantify spatial and temporal H<sub>2</sub>S concentrations in swine houses (A Progress Report) Animal Industry Report. A.S. Leaflet R2436. ISU Extension, Ames, IA.
11. Li, H., **H. Xin**, and R.T. Burns. 2008. Ammonia and PM emissions from a tom turkey barn in Iowa. Animal Industry Report. A.S. Leaflet R2449. ISU Extension, Ames, IA.
12. Li, H. **H. Xin**, R.T. Burns, S.A. Roberts, K. Bregendahl. 2008. Effects of dietary modification on laying hens in high-rise houses: Part I – ammonia, hydrogen sulfide and carbon dioxide gaseous emissions. Animal Industry Report. A.S. Leaflet R2450. ISU Extension, Ames, IA.
13. Roberts, S.A. H., Li, **H. Xin**, R.T. Burns, and K. Bregendahl. 2008. Effects of dietary modification on laying hens in high-rise houses: Part II – hen production performance. Animal Industry Report. A.S. Leaflet R2451. ISU, Ames, IA.
14. Davis, J.D., **H. Xin**, and R. McDonald. 2005. Creep temperature distributions of incandescent heat lamps. A.S. Leaflet R2152. ISU Extension, Ames, IA.
15. Roberts, S. **H. Xin**, B. Kerr, J. Russell, K. Bregendahl. 2005. Adding fiber to the diet of laying hens reduces ammonia emissions. Proc. of the Iowa Egg Industry Symposium, ISU Extension, Ames, Iowa, pp 29-37.
16. **Xin, H.**, H. Li, and Y. Liang. 2005. Update on ammonia emission mitigation for laying hen facilities. Proc. of the Iowa Egg Industry Symposium, Iowa State University Extension, Ames, Iowa, pp 38-46.
17. **Xin, H.**, H. Li, Y. Liang, and J. Richardson. 2005. Update on ammonia emission mitigation for egg facilities. A.S. Leaflet. Leaflet R2135. ISU Extension, Ames, IA.
18. Xin, H. 2005. Instruments for measuring concentrations and emission rates of gases and particulates from animal feeding operations. PM 1990, ISU Extension, Ames, IA
19. Cook, R.N. and **H. Xin**. 2004. Effects of cage stocking density on feeding behaviors of group-housed laying hens. Proc of the Iowa Egg Industry Symposium, Iowa State University, pp41-47.
20. Cook, R.N. and **H. Xin**. 2004. Effects of cage stocking density on feeding behaviors of group-housed laying hens. College of Agriculture Research Report, ASL # 516, Iowa State University.
21. Liang, Y., **H. Xin**, and H. Li. 2004. Dietary manipulation to reduce ammonia emission from high-rise layer houses. College of Agriculture Research Report, ASL # 517, Iowa State University.
22. Liang, Y., **H. Xin**, H. Li, and E. F. Wheeler. 2004. Ammonia emissions from layer houses. College of Agriculture Research Report, ASL # 518, Iowa State University.
23. Liang, Y. and **H. Xin**. 2004. Performance of Single Point Monitor in measuring ammonia and hydrogen sulfide gases. College of Agriculture Research Report, ASL#519, Iowa State University.
24. Li, H., **H. Xin**, and Y. Liang. 2004. Indirect Measurement of Building Ventilation Rate for Manure-belt Laying Hen House Using CO<sub>2</sub> Balance. College of Agriculture Research Report, ASL # 520, Iowa State University.
25. **Xin, H.**, Y. Liang, R.S. Gates, and E. F. Wheeler. 2002. Measurement of ammonia emissions from laying hen houses. Proceedings of the Iowa Poultry Industry Symposium held in Scheman Continuation Education Center on November 12, 2002, Ames, Iowa. Pp 53-58.
26. **Xin, H.** 2000. Cooling laying hens by low-pressure sprinkling or high-pressure fogging. Proceedings of the Iowa Poultry Symposium held in Scheman Continuation Education Center on February 17, 2000, Ames, Iowa. Pp 43-47.
27. Researcher offers study on cooling poultry houses. *Poultry Times*, March 20, 2000: 16.
28. **Xin, H.** 2000. Sprinkling and fogging can help cool laying hens. *Poultry Times*, April 17: 3 & 13.
29. **Xin, H.** 1999. Nutrient profile, manure production of layers. *Poultry Times – Supplement*. April 19, 1999: 2A.
30. Keeping wean-to-finish trouble free. *Pork'99/July*: 25.
31. **Xin, H.**, J.D. Harmon, R.C. Ewan, D.L. Harris, and M.L. Gramer. 1999. Transporting isowean pigs – Part I: nutritional perspective. *Swine Research Report*. ISU Extension, AS 642: 150-156, Ames, Iowa.
32. **Xin, H.**, Q. Zhang, M. Puma, J.D. Harmon, D.L. Harris, and M.L. Gramer. 1999. Transporting isowean pigs – Part II: thermal environment perspective. *Swine Research Report*. ISU Extension, AS 642: 157-164, Ames, Iowa.



33. **Xin, H.**, and Q. Zhang. 1999. Surface temperature of creep heat mat as affected by piglet usage. *Swine Research Report*. ISU Extension, AS 642: 143-149, Ames, Iowa.
34. Ye, W. and **H. Xin**. 1999. Resting behavior indexes for thermal comfort assessment of young pigs. *Swine Research Report*. ISU Extension, AS 642: 134-142, Ames, Iowa.
35. Nutrients aid chick growth in overseas shipments. 1999. *Poultry Times*, July 26: 16.
36. High-rise layer house manure volume and nutrient control. 1998. *Egg Industry*, August 1998: 10.
37. Iowa researchers find disparity in state manure estimates. 1998. *Poultry Times*, Sept 7, 1998:12
38. **Xin, H.** 1998. Surface temperature distribution of commercial heat mats for swine creep heating. *Swine Research Report*. ISU Extension, AS 640: 115-120, Ames, Iowa.
39. **Xin, H.** 1998. Old litter brooding for broilers needs proper ventilation. *Poultry Times*, October 19.
40. **Xin, H.** 1998. Cold weather ventilation guidelines for young turkeys. Year End 1998 Edition of *Turkey Talk*, the Official Publication of the Iowa Turkey Federation, Ames, Iowa.
41. **Xin, H.** 1998. Efficacy of sprinkling on heat stress alleviation and dust reduction in layer houses. A demonstration project report to Farmegg Products, Humboldt, IA and CATD.
42. Harmon, J.D., T.J. Baas, S.J. Hoff, and **H. Xin**. 1998. Case study comparison of three styles of swine facilities. *Swine Research Report*. ISU Extension, AS 640: 133-136, Ames, Iowa.
43. Energy savings in swine production – Iowa Energy Success Story. 1998. *Watt Savers*: 2-7.
44. Porcine computerized comfort. 1998. *Visions Winter 1998*: 7.
45. **Xin, H.** and H. Zhou. 1997. Responses of piglets to heat lamps with variable vs. constant wattage output and clear vs. red radiant rays. *Swine Research Report*. ISU Extension AS-638:53-56. Ames, Iowa.
46. **Xin, H.** and J.D. Harmon. 1997. Heat stress index and alleviation measures for layers, turkeys, swine, and cattle. ABE Extension (<http://www.ae.iastate.edu/livestoc.htm>), ISU, Ames, Iowa.
47. Computer would measure pigs' comfort. 1997. *Kearney (Neb) Daily Hub*. July 16, 1997.
48. Computer helps keep pigs comfy. 1997. *Capper's*. September 9, 1997.
49. It's a pig's life. 1997. *The Harold Journal*, Logan, Utah.
50. Little pigs, are you comfortable. 1997. *Waukesha Freeman*. July 15, 1997.
51. Little pigs, are you comfortable. 1997. *Boone County Ag Life*. July 8, 1997.
52. Wallowing in comfort. 1997. *Waterloo-Cedar Falls Courier*. July 7, 1997.
53. **Xin, H.** 1996. Principles of Poultry House Ventilation. Proceedings of 1996 Iowa Poultry Symposium. College of Veterinary Medicine. Iowa State University, Ames, Iowa, pp5-18.
54. Harmon, J.D. and **H. Xin**. 1996. Thermal performance of a hoop structure for finishing swine. *Swine Research Report*. ISU Extension AS-634: 104-106. Ames, Iowa.
55. Harmon, J.D., **H. Xin**, and J. Shao. 1996. Evaluation of the thermal needs of the early weaned pig. *Swine Research Report*. ISU Extension AS-634: 87-91. Ames, Iowa.
56. Hoff, S.J., J.D. Harmon, **H. Xin**, and L. Dong. 1996. Treating ventilation exhaust air for odor control. *Swine Research Report*. ISU Extension AS-634: 111-116. Ames, Iowa.
57. Shao, J., **H. Xin**, and J.D. Harmon. 1996. Neural network analysis of postural behavior of young swine to determine their thermal comfort. *Swine Research Report*. ISU Extension AS-634: 125-128. Ames, Iowa.
58. **Xin, H.**, H. Zhou, and D.S. Bundy. 1996. Heat lamp usage by neonatal piglets. *Swine Research Report*. ISU Extension AS-634: 117-124. Ames, Iowa.
59. **Xin, H.**, H. Zhou, and D.S. Bundy. 1995. Comparison of 250W vs. 175W radiant heat lamps for swine farrowing operation. *Swine Research Report*. ISU Extension AS-633: 129-131. Ames, IA.
60. Harmon, J.D. and **H. Xin**. 1995. Environmental guidelines for confinement swine housing. Pm-1586a. Iowa State University, Ames, Iowa.
61. Harmon, J.D. and **H. Xin**. 1995. Choosing fans for livestock and poultry ventilation. Pm-1587. Iowa State University, Ames, Iowa.

62. **Xin, H.** and V.J. McFadden. 1995. Tunnel ventilation to alleviate animal heat stress. Pm-1606. Iowa State University, Ames, Iowa.
63. Harmon, J.D. and **H. Xin.** 1994. Health hazards in swine confinement housing: How bad is bad? AEN-156. Iowa State University, Ames, Iowa.
64. Harmon, J.D., R. Zhang, and **H. Xin.** 1994. Human health concerns in livestock and poultry housing. AEN-157. Iowa State University, Ames, Iowa.
65. **Xin, H.** and I.L. Berry. 1993. Broiler research verification for energy efficiency and optimum production-summary of 1991, 1992 & 1993 test results. Univ. of Arkansas, Fayetteville, AR.

**Other General Audience Publications**

More than 100 project reports submitted to funding agencies.

**Technology Transfer**

*Industrial Licensing:*

- Method to alleviate long-journey transport stress and mortality of chicks (ISURF # 02089)
- Innovative chick shipping container (ISURF # 02019)

*Intellectual Property Disclosure:*

- Behavior-Based Interactive Environmental Controller for Swine (ISURF #02716)

**CONTRACTS AND GRANTS (1994-present)**

Principal investigator (PI) or Co-PI of **\$23,695,150** contracts and grants in competitive research, extension and education programs. Listed below are collaborating colleagues at ISU and other institutions.

<b>Name</b>	<b>Position</b>	<b>Department/Affiliation</b>
Ahn Dong U.	Professor	AnSci
Beck, Mary M.	Professor and Dept. Head	Mississippi State Univ.
Benson, Eric	Professor	University of Delaware
Bregendahl, Kristjan	Assistant Professor	AnSci (now ADM)
Brown-Brandl, Tami	Agricultural Engineer	USDA-ARS-MARC
Burns, Robert T.	Associate Dean and Professor	ABE (now at U of TN)
Dixon, Philip M.	University Professor	Statistics
Dong, Hongmin	Professor and Director General	CAAS, Beijing, China
Gates, Richard S.	Professor	University of Illinois
Halbur, Patrick G.	Professor and Dept Chair	Vet Med
Harmon, Jay D.	Professor	ABE
Harris, Dilbert (Hank) L.	Professor (retired)	AnSci
Heber, Albert J.	Professor	Purdue University
Hoff, Steven J.	Professor	ABE
Ibarburu, Maro	Associate Scientist	Egg Industry Center
Kanwar, Ramesh	Distinguished Professor	ABE
Kerr, Brian	Research Leader	USDA-ARS
Kliebenstein, Jim	Professor (retired)	Economics
Koziel, Jacek	Associate Professor	ABE
Koelkebeck, Ken	Professor	University of Illinois
Li, Hong	Assistant Professor	University of Delaware
Mench, Joy	Professor (retired)	UC-Davis
Lorimor, Jeffery C.	Associate Professor (retired)	ABE
Mickelson, Steve	Professor & Chair	ABE
Millman, Suzanne	Associate Professor	Vet. Diag. & Prod. Ani. Med.
Noll, Sally	Professor	University of Minnesota
Patience, John	Professor	AnSci
Persia, Michael E.	Assistant Professor	AnSci (now VPI)
Powers, Wendy	Professor	AnSci (now UC-Davis)
Patterson, Paul	Professor	The Penn State University
Ramirez, Brett	Assistant Professor	ABE
Richard, Tom	Professor	ABE (now PSU)
Reynnells, Richard D.	National Program Leader (retired)	USDA, Washington D.C.
Robin, Paul	Senior Researcher	INRA UMR SAS, France
Sato, Yuko	Assistant Professor	Vet. Diag. & Prod. Ani. Med.
Sell, Jerry L.	Distinguished Professor (retired)	AnSci
Stewart, Brian	Professor	ABE
Swanson, Janice	Department Chair and Professor	Michigan State University
Tao, Yang	Professor	University of Maryland
Tang, Lie	Associate Professor	ABE
Trampel, Darrell W.	Professor (deceased)	Vet. Diag. & Prod Ani. Med.
Venkitanarayanan, Kumar	Professor	University of Connecticut
Wang, Tong	Professor	Food Sci. & Human Nutrition

## Collaborating colleagues at ISU and other institutions (cont'd).

<b>Name</b>	<b>Position</b>	<b>Department/Affiliation</b>
Wesley, Irene	Research Scientist (retired)	Nat'l Animal Disease Center
Wheeler, Eileen F.	Professor	The Penn State University
Yoon, K.J.	Professor	Vet. Diag. & Prod. Ani. Med.
Zhang, Qiang	Professor	University of Manitoba, Canada
Zhang, Ruihong	Professor	UC-Davis
Zhao, Lingying	Professor	The Ohio State University

**Abbreviation of Funding Agencies:**

6-SCAWM:	6-State Consortium on Animal Waste Management
AEB:	American Egg Board
AFRDI:	Agri-Food Research and Development Initiative and Manitoba Hydro
ASHRAE:	American Society of Heating, Refrigerating, and Air Conditioning Engineers
BFE:	Bureau of Foreign Experts, China
CAAS:	Chinese Academy of Agricultural Sciences
CATD:	Center for Advanced Technology Development
CFI:	Center for Food Integrity
CIRAS	Center for Industry Research Assistance Service
EFC:	Egg Farmers of Canada
FIPSE-DOE:	Funds for Improvement of Post-Secondary Education, US Department of Education
HLI:	Heartland Lysine, Inc., Chicago, IL
Hy-Line	Hy-Line International
ICF:	Iowa Cage Free, Johnston, Iowa
ICPB:	Iowa Corn Promotion Board
IEC:	Iowa Egg Council
ILHAC:	Iowa Livestock Health Advisory Council
IPPA:	Iowa Pork Producers Association
IPRT:	Institute for Physical Research and Technology
ISPB:	Iowa Soybean Promotion Board
ISU-COE:	ISU College of Engineering Seed Grant
ISU-DAIRG:	ISU Dean of Agriculture's International Research Grants
ISU-SPRIG:	ISU Special Research Initiation Grant
ITF/ ITMC:	Iowa Turkey Federation/Iowa Turkey Marketing Council
MAAS:	Manitoba Association of Agricultural Societies
MPC:	Midwest Poultry Consortium
MPRP:	Midwest Poultry Research Program
MOA:	Ministry of Agriculture, China
NE-127:	Multi-state Research Project "Biophysical Models for Poultry Production Systems"
NII:	Novus International, Inc.
NPB:	National Pork Board
NPPC:	National Pork Producers Council
PIC:	Pig Improvement Company
RSCHE:	Russian State Commission of Higher Education
UEA:	United Egg Allied
UEP:	United Egg Producers
USDA-ARS-MARC:	U.S. Department of Agriculture Research Service Meat Animal Research Center
USDA-FAS:	U.S. Department of Agriculture Foreign Agricultural Service
US EPA:	U.S. Environmental Protection Agency
USPEA:	U.S. Poultry and Egg Association
USDA-NIFA:	USDA National Institute of Food and Agriculture
USDA-NRI:	USDA National Research Initiative Competitive Program

*Funded Research Grants/Contracts (in chronological order):*

<b>Project Title</b>	<b>Grantor</b>	<b>PI</b>	<b>Co-PI</b>	<b>Period</b>	<b>Amount</b>
Air quality/environmental evaluation and development of improved management strategies for a novel cage-free layer facility	ICF/CIRAS	Ramirez	<b>Xin</b>	02/01/18 – 01/31/19	\$84,000
AEB and EIC partnership to provide monthly industry reports, economic analysis and information synthesis for the U.S. egg industry	AEB	<b>Xin</b>	Ibarburu	01/01/18 – 12/31/18	\$107,600
Evaluating behavioral responses of poultry to ultraviolet light via preference test	Once Innovations	<b>Xin</b>	Liu, Sato	02/01/17 – 08/31/17	\$74,400
Enhancing the health and well-being of preweaning piglets	USDA-NIFA	<b>Xin</b>	Brown-Brandl, Stinn, Vallet, Butters-Johnson	02/16/16 – 02/15/18	\$500,000
Comprehensive evaluation of a programmable LED light vs. traditional CFL light for egg production (Phase II)	Hy-Line and CIRAS	<b>Xin</b>	Wang, Liu	03/01/16 – 12/31/16	\$80,000
Airborne transmission of highly pathogenic avian influenza virus in the poultry industry and the role of dust as a carrier	USDA-NIFA	<b>Xin</b>	Y. Zhao, Yoon	09/01/15 – 08/31/17	\$100,000
Research on avian influenza outbreaks	EFC	<b>Xin</b>		06/01/15 – 05/31/18	\$384,615 (\$500,000 Canadian \$)
Understand, mitigate and prevent HPAI outbreaks	AEB	<b>Xin</b>	Y. Zhao, Takle	09/01/15 – 08/31/17	\$120,000
Egg Industry Center economic analysis and statistical reports	AEB	<b>Xin</b>	Ibarburu	01/01/13 – 12/31/16	\$312,741
Comprehensive evaluation of a programmable LED light vs. traditional CFL light for egg production (Phase I)	Hy-Line and CIRAS	<b>Xin</b>	Liu, Wang	03/01/15 – 12/31/15	\$65,000
Electrostatic precipitation for air cleaning of particulate matter (PM) emissions at animal production facilities	USDA-NIFA	L. Zhao	Zhu, <b>Xin</b> , Lee	01/01/16 – 12/31/18	\$499,953
An innovative system to improve environment and productivity of aviary hen housing	USDA-NIFA	<b>Xin</b>	Y. Zhao, Wang, Millman, Soupier	12/15/14 – 12/14/17	\$496,176
Comparison of environmental footprint of U.S. eggs vs. other plant and animal sources	AEB	<b>Xin</b>	Ibarburu, Pelletier, Wang	02/25/14 – 02/24/15	\$75,048
Evaluation of LED lighting in aviary hen housing	IPRT and ICF	<b>Xin</b>	Wang, Y. Zhao	07/01/13 – 06/30/14	\$50,449
Evaluation of transportation conditions on performance of weaned and feeder pigs	NPB	Harmon	<b>Xin</b> , Hoff, Baas	07/01/13 – 06/30/14	\$47,196
Quantification of greenhouse gas emissions from a Midwestern swine breeding/farrowing /gestation facility	IPPA	<b>Xin</b>	Burns, Patience	08/01/12 – 03/01/14	\$86,999
An examination of argon gas for on-farm anesthesia and euthanasia of livestock	USDA-NIFA	Millman	<b>Xin</b> et al.	10/01/12 – 09/30/15	\$483,464
Comparing heat lamp vs. heat mat for farrowing crate heating	IPPA	<b>Xin</b>	Stinn	08/01/12 – 12/31/13	\$16,914

**Funded Research Grants/Contracts (in chronological order):**

<b>Project Title</b>	<b>Grantor</b>	<b>PI</b>	<b>Co-PI</b>	<b>Period</b>	<b>Amount</b>
A comparative assessment of environmental footprint of the U.S. egg production supply chains between 1960 and 2010	AEB, USPEA, UEA	<b>Xin</b>	Ibarburu, Pelletier, Westergard	08/06/12 – 08/05/13	\$120,000
Assessment of alternative production systems for laying hens to safeguard animal welfare and sustainable egg supply	USDA-NIFA	<b>Xin</b>	Li, Tang, Millman, Ibarburu-Blanc, Brehm-Stecher, et al.	04/15/11 – 04/14/14	\$700,000
Sustainable egg production: animal welfare, human health, environmental and economic aspects	CFI (through UC-Davis)	Swanson, Mench, <b>Xin</b> , Jones	~ 20 scientists at MSU, UCD and USDA-ARS	10/01/10 – 09/30/14	\$6,000,000 Xin's share: \$1,023,388
Quantitative electroencephalography as an indicator of broiler and layer chicken welfare status during exposure to various stressful conditions	USDA-NIFA	Benson (U of DE)	<b>Xin</b> , Alphin (UD), Johnson (UPenn), Persia	10/01/10 – 09/30/12	\$238,500
Sustaining Iowa pork production and air quality	IPPA	<b>Xin</b>	Colletti	09/01/10 – 08/31/13	\$57,000
Development of monitoring methods for quantifying greenhouse gas emissions reduction through use of biogas digesters for livestock manures in China	US EPA	Dong	Zhu, <b>Xin</b>	10/01/10 – 09/30/13	\$372,750
Reducing egg-borne outbreaks of Salmonella Enteritidis by integrating research and extension	USDA-NIFA	Venkitanarayanan	Darre, <b>Xin</b> , Curtiss, Patterson	09/01/10 – 08/31/14	\$598,551 Xin's share: \$51,881
Donation of National Air Emissions Monitoring Study (NAEMS) equipment to Egg Industry Center (Gift in Kind)	AEB	<b>Xin</b>		07/01/10	\$ 596,945
Quantification of greenhouse gas emissions from a Midwestern swine breeding/farrowing /gestation facility	IPPA	<b>Xin</b>	Burns, Patience	08/01/10 – 07/31/12	\$135,474
Midwest Poultry Research Program	USDA-NIFA Special Grant	<b>Xin</b>	Li, Ibarburu, Persia, Millman, Brehm-Stecher	08/01/10 – 07/31/11	\$438,345
A comprehensive assessment of aviary laying-hen housing system for egg production in the Midwest (supp. funding)	IEC	<b>Xin</b>	Li, Ibarburu, Millman	04/01/10 – 08/31/11	\$30,000
Sponsorship of Egg Industry Issues Forum	AEB	<b>Xin</b>		03/01/10 – 09/01/10	\$30,000
Cash match funding for the USDA NRCS CIG Project – Part 2	UEP	<b>Xin</b>	Li	01/01/10 – 08/31/10	\$50,000
Characterizing the carbon footprint of U.S. egg production using life cycle assessment	AEB	<b>Xin</b>	Ibarburu, Pelletier	01/01/10 – 12/31/10	\$46,485
Effects of long-term supplementation of layer diets with high concentrations of cholecalciferol on egg yolk Vitamin D concentration, egg quality, hen performance and hen health	AEB & IEC	<b>Persia</b>	Wang, <b>Xin</b> , Lamont, Beitz	01/01/10 – 12/31/11	\$119,103

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<b>Project Title</b>	<b>Grantor</b>	<b>PI</b>	<b>Co-PI</b>	<b>Period</b>	<b>Amount</b>
Ammonia emissions of pullets and laying hens as affected by stocking density – Yr 2	IEC	<b>Xin</b>	Li, Mendes	07/01/09 – 06/30/10	\$46,132
Evaluation of different diets on ammonia emission and production performance of laying hens	IEC	<b>Xin</b>	Chepete, Li	07/01/09 – 06/30/10	\$43,670
Impacts of feeding DDGS to swine: aerial emissions and potential management strategies	IPPA	Burns	<b>Xin</b>	07/01/09 – 10/31/10	\$107,347
Midwest Poultry Research Program	USDA-CSREES Special Grant	<b>Xin</b>	Wang, Reitmeier	08/01/09 – 07/31/10	\$439,107
Midwest Poultry Research Program	USDA-CSREES Special Grant	<b>Xin</b>	Ahn	09/01/08 – 08/31/09	\$389,947
Updating heat and moisture production rates of modern swine and their housing systems	ASHRAE	Brown-Brandl	<b>Xin</b>	04/01/09 – 05/30/12	\$180,000 Xin's share: \$64,441
Ammonia emissions of pullets and laying hens as affected by stocking density	IEC	<b>Xin</b>	Li, Mendes	07/01/08 – 06/30/09	\$43,419
Assessing hen response to ammonia and thermal comfort combinations via preference test	IEC	<b>Xin</b>	Li, Hayes	07/01/08 – 06/30/09	\$49,033
Hydrogen sulfide spatial distribution and worker exposure in swine houses	IPPA	Burns	Keren, <b>Xin</b> , Hoff	05/01/08 – 04/30/09	\$49,715
An automated feed intake and body weight monitoring system for individual turkeys raised in flocks	Hybrid Turkeys (ON, Canada)	Tang	<b>Xin</b>	01/01/08 – 06/30/09	\$189,761
Feeding DDGS and other altered diets to egg laying hens to demonstrate economically viable reductions in ammonia emissions – a United Egg Producers endeavor with university collaborators	USDA-NRCS-CIG (Flow-through UEP)	<b>Xin</b>	Gregory, Burns, Gates Bregendahl, Kliebenstein, Wheeler, Patterson	10/01/07 – 03/31/10	\$812,998 Xin's share: \$432,030
Cash match funding for the USDA NRCS CIG Project	UEP	<b>Xin</b>	Burns, Bregendahl, Kliebenstein	10/01/07 – 03/31/10	\$100,000
Evaluating the effect of dietary corn DDGS on microbial populations in the intestine of the laying hen	IEC	<b>Xin</b>	Roberts, Bregendahl, Trampel	07/01/07 – 06/30/08	\$43,558
Determining ammonia and particulate matter emissions from Midwest turkey grow-out buildings	USDA-NRI	<b>Xin</b>	Burns, Jacobson, Harmon, Hoff, Noll	03/01/07 – 02/28/09	\$499,933

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<b>Project Title</b>	<b>Grantor</b>	<b>PI</b>	<b>Co-PI</b>	<b>Period</b>	<b>Amount</b>
Determining ammonia and particulate matter emissions from Midwest turkey houses	Iowa Turkey Federation	<b>Xin</b>	Burns, Harmon, Hoff, Li	07/01/07 – 02/28/08	\$15,000
Development and testing of a hydrogen sulfide detection system for use in swine housing	NPB	Burns	<b>Xin</b> , Hoff, Moody, Muhlbauer	03/01/07 – 02/28/08	\$48,389
Field verification of ammonia emission mitigation strategies for layer houses	USPEA	<b>Xin</b>	Burns, Wheeler, Patterson, Gates	03/01/07 – 02/28/08	\$70,436
Reference procedures to measure polluting emissions from livestock buildings and storage to air	ADEME (French Environment and Energy Agency)	Robin	<b>Xin</b> et al. (14 international institutions)	01/01/07 – 02/28/09	€1,040,741 (\$1,352,963) Xin's share: €34,222
Development of a producer-oriented portable tool for measurement of ammonia emission from high-rise house or manure storage	IEC	<b>Xin</b>		07/01/06 – 06/30/07	\$15,167
Effect of dietary corn DDGS on ammonia emission and egg production parameters from laying hens: an industry-scale study	Dakota Gold Marketing	Bregendahl	<b>Xin</b> , Roberts	01/01/07 – 12/31/08	\$40,000
Laying hen manure characteristics and air emissions as affected by genetic strains	MPRP & Hy-Line	<b>Xin</b>	Arthur, Burns	03/01/06 – 02/28/07	\$27,160
Field verification of dietary manipulation on ammonia emission and hen performance in high-rise layer houses	EcoCal Products & IEC	<b>Xin</b>	Burns, Bregendahl	01/01/06 – 06/30/07	\$150,000
Air quality for laying hens in cage high-rise, cage manure-belt, and floor aviary housing systems	IEC	Trampel	<b>Xin</b>	01/01/06 – 12/31/06	\$16,255
Partial funding to support acquisition of a thermal desorption system for AFO air quality research	IEC	Koziel	<b>Xin</b>	07/01/06 – 12/31/06	\$10,000
Comparative evaluation of a new heat lamp fixture and controller	Retrolite of America, Inc.	<b>Xin</b>		12/01/05 – 12/31/05	\$5,800
A systematic evaluation of laying hen housing schemes intended to improve bird welfare	IEC	<b>Xin</b>	Green	10/01/05 – 09/30/07	\$50,840
Developing and validating a process-based ammonia emission model for confinement animal feeding operations	USDA-NRI	R. Zhang	<b>Xin</b> , Fadel (UCD), Ogejo (VPI) & Heber	01/01/06 – 12/31/07	\$496,643 Xin's share: \$100,000
Total suspended particulate, PM10, PM2.5, hydrogen sulfide and hydrocarbon national consent agreement emissions determination from broiler production systems	Tyson Foods	Burns	<b>Xin</b> , Gates, Hoff	10/01/05 – 09/30/07	\$648,231



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<b>Project Title</b>	<b>Grantor</b>	<b>PI</b>	<b>Co-PI</b>	<b>Period</b>	<b>Amount</b>
Characterization and mitigation of ammonia and odor emissions from laying hen manure storage and composting	Midwest Poultry Consortium	<b>Xin</b>	Wang, Koziel, Koelkebeck	04/1/05 – 03/31/06	\$53,859
Measurement of ammonia emission rate from broiler production houses	Tyson Foods	Burns	<b>Xin</b>	03/28/05 – 09/28/06	\$399,525
Mitigating ammonia emissions from egg production facilities	Iowa Egg Council	<b>Xin</b>		12/1/04 – 11/30/07	\$100,000
Mitigation of ammonia emissions from layer manure storage	US PEA	<b>Xin</b>	Wang, Liang,	10/01/04 – 09/30/05	\$54,579
Mitigation of ammonia emissions from layer operations by bio/chemical treatment of manure	ISU-AES	<b>Xin</b>	Burns, Hoff, Harmon, Koziel, Wang	10/01/04 – 09/30/05	\$55,000
Development of an improved process-based ammonia model for agricultural sources	Lake Michigan Air Directors Consortium	Gail Tonnesen, UCR/ISSRC	R. Zhang, <b>Xin</b> , et al.	07/01/04 – 03/31/05	\$250,000 Xin's share: \$30,000
Effects of stack surface to volume ratio and air exchange rate on ammonia Emission of Laying Hen Manure Storage	IEC & IPRT	<b>Xin</b>	Richard, Kerr	03/01/04 – 02/28/05	\$44,339
Measurement and mitigation of odor and air emissions from concentrated animal feeding operations	USDA	Kanwar	Hoff, <b>Xin</b> , Harmon	06/01/04 – 09/30/07	\$500,731
Effects of beak-trimming and feed form on turkey poult feeding behavior and growth	USPEA	Noll	<b>Xin</b>	06/01/04 – 05/31/05	\$44,609 Xin's share: \$14,985
Use of bedded hoop structures as an alternative swine housing system to improve environmental soundness and sustainability of water resources	USDA-FAS	Harmon	<b>Xin</b> , Dong	07/01/04 – 06/30/07	\$45,000
Biosystems and Agricultural Engineering Training – Consortium for sustainable plant and animal production systems	FIPSE-DOE	Gates	<b>Xin</b>	09/01/03 – 08/31/08	\$207,000 Xin's share: \$108,000
Reduction of ammonia, odorous volatile organic compounds, and nitrogen excretion by manipulation of crude protein and fermentable fiber levels in laying-hen diets	MPF & NII	Bregendahl	<b>Xin</b> , Russell, Kerr	03/01/04 – 02/28/05	\$51,739
ABE Air Quality Initiative – development of sampling system for downwind emission measurement	IPPA	Hoff	<b>Xin</b> , Bundy, Harmon	07/01/03 – 06/30/04	\$100,000
Determining dynamic CO <sub>2</sub> release profiles of CO <sub>2</sub> Pak <sup>TM</sup>	CO <sub>2</sub> Technology & CATD	<b>Xin</b>	Wang	01/01/03 – 03/31/03	\$18,090

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<b>Project Title</b>	<b>Grantor</b>	<b>PI</b>	<b>Co-PI</b>	<b>Period</b>	<b>Amount</b>
Lab evaluation and field verification of Single Point Monitors (SPM's) for measuring aerial ammonia and hydrogen sulfide associated with swine operations	NPB	<b>Xin</b>	Hoff, Richard, Kerr	01/01/03 – 06/30/04	\$80,532
Direct measurement of dietary and management strategy impacts on ammonia volatilization	IPPA	Powers	Lorimor, <b>Xin</b>	07/01/02 – 06/30/03	\$25,500
Reducing ammonia emissions from poultry houses by enhanced manure and diet management	USDA – IFAFS Program	Gates	<b>Xin</b> , Wheeler	10/01/01 – 09/30/03	\$873,754 Xin's share: \$227,960
Improving measurement of emissions from poultry houses	6-SCAWM	<b>Xin</b>	Heber	10/01/01 – 09/30/02	\$163,344 Xin's share: \$67,625
Establishment of baseline data on aerial ammonia concentration and emission rate in Iowa pullet and layer houses	IEC & CATD	<b>Xin</b>	Gates	05/01/01 – 04/30/02	\$53,170
Optimizing partial surface wetting to cool caged layers	USPEA	<b>Xin</b>	Gates, Dixon	07/01/01 – 06/30/02	\$52,279
Poultry environment research (gift)	HLI	<b>Xin</b>		2001	\$15,000
Cooling cage laying hens by partial surface wetting	USPEA	<b>Xin</b>	Gates, Dixon, Beck	07/01/00 – 06/30/01	\$24,000
Evaluation of drinking water temperature on laying hen performance	IEC	<b>Xin</b>	Ahn	04/01/00 – 07/31/00	\$5,000
Training of a Brazilian scholar (Yanagi, Jr.) in poultry environment control	The CAPES Foundation of Brazil	<b>Xin</b>		06/16/00 – 08/06/01	\$8,300
Quantification of feeding and drinking behaviors of poultry for enhanced animal well-being	USDA-NRI	Gates	<b>Xin</b>	09/01/00 – 08/31/01	\$150,709
Minimizing ammonia loss to the atmosphere from high-rise layer facilities	IEC	Lorimor	<b>Xin</b>	06/01/00 – 05/31/01	\$29,050
Use of infrared imaging (IRI) to improve detection of disease in pigs	ILHAC	Halbur	<b>Xin</b>	04/01/00 – 03/31/01	\$19,050
Water quality: Reducing environmental contamination with an emphasis on animal production facilities	USDA Emerging Markets	Reynnells	Brubaker, <b>Xin</b>	10/01/00 – 09/30/01	\$50,000
Effects of heat lamp usage on performance of piglets shortly after birth	AFRDI	Zhang	<b>Xin</b>	01/01/00 – 12/31/01	\$48,000
Updating heat and moisture production rates of poultry and their housing systems	ASHEAE	<b>Xin</b>		04/01/99 – 03/31/01	\$124,572

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<b>Project Title</b>	<b>Grantor</b>	<b>PI</b>	<b>Co-PI</b>	<b>Period</b>	<b>Amount</b>
Evaluation and demonstration of livestock waste pollution reduction strategies and practices	USDA-FAS	<b>Xin</b>	Lorimor, Dong	02/01/99 – 01/31/02	\$30,000
Effects of fluctuating temperatures on PIC Isowean pigs	PIC	<b>Xin</b>	Ewan, Harmon, Harris	01/01/99 – 05/31/99	\$28,576
Development of a real time behavior-based swine comfort controller	NPPC	<b>Xin</b>		07/01/99 – 06/30/00	\$18,500
Infrared imaging for on-line, non-contact doneness inspection of chicken meat	USDA-NRI	Tao	<b>Xin</b>	10/01/99 – 03/31/02	\$125,000
Economic evaluation of wean-to-finish production systems	IPPA	Baas	Harmon, <b>Xin</b>	04/01/99 – 03/31/00	\$23,260
Performance evaluation of heat mats in swine farrowing facilities	MAAS	Zhang (UM, Canada)	<b>Xin</b>	09/01/98 – 08/31/99	\$20,800
Environmental impact of the use of poultry manure for agriculture production	IEC, Leopold Center	Kanwar	Lorimor, <b>Xin</b>	07/01/98 – 06/31/04	\$145,100
Environment control for livestock and poultry production	MOA, BFE	Dong	<b>Xin</b>	01/01/98 – 12/31/05	\$150,000+
A novel environmental controller to maximize swine thermal comfort	CATD	<b>Xin</b>		04/01/98 – 12/31/98	\$11,000
Responses of PIC isowean pigs to simulated overseas transportation conditions	PIC	<b>Xin</b>	Ewan, Harmon, Harris	01/01/98 – 05/31/98	\$25,586
Evaluation of high-pressure fogging and low-pressure sprinkling systems for heat stress relief and aerosols suppression in high-rise caged layer houses	CATD and Farmegg Products, Inc	<b>Xin</b>		04/01/98 – 06/30/99	\$33,492
Quantification of postural behavior as thermal comfort indicator to pigs	NPPC	<b>Xin</b>		07/01/98 – 06/30/99	\$18,500
Development and application of an instrumentation system to measure feeding and drinking behavior of poultry as influenced by environment and nutrition interactions	HLI	<b>Xin</b>	Gates	04/01/98 – 03/31/00	\$78,650
Biophysical models for poultry production system	NE127	<b>Xin</b>		10/01/98 – 06/30/05	\$62,000
Image analysis of swine postural behavior to improve thermal comfort	IPPA	<b>Xin</b>	Udpa	07/01/97 – 06/30/98	\$18,000

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<b>Project Title</b>	<b>Grantor</b>	<b>PI</b>	<b>Co-PI</b>	<b>Period</b>	<b>Amount</b>
Reciprocal visit by Dr. Hongmin Dong of CAAS for training in swine & poultry environment	ISU-DAIRG	<b>Xin</b>		01/01/98 – 08/31/98	\$1,500
Heat and moisture production of tom turkeys during brooding-growth period	ITF	<b>Xin</b>	Sell	07/01/97 – 12/31/97	\$4,729
Efficacy of Novus 1027™ as an in-transit nourishment for chicks	NII	<b>Xin</b>	Sell	01/01/97 – 06/30/97	\$11,303
Development of an energy conservation education program for Iowa's livestock and poultry industry	Iowa Energy Center	Harmon	Hoff, <b>Xin</b>	07/01/97 – 06/30/99	\$45,074
Alleviating in-transit chick mortality and weight loss via supply of pre-shipment nourishment and improved microenvironment	USPEA	<b>Xin</b>	Sell	05/01/97 – 04/30/98	\$44,179
An innovative method to alleviate stress and subsequent mortality of breeder chicks for long-journey overseas shipments	USPEA	<b>Xin</b>	Sell	05/01/96 – 04/30/97	\$40,268
Determination of high-rise layer house manure volume and nutrient content	USPEA	<b>Xin</b>	Lorimor	01/01/97 – 12/31/97	\$39,215
Economic evaluation of finishing facilities and development of a decision-aid energy estimator program for the swine industry	Iowa Pork Industry Center	<b>Harmon</b>	Hoff, Xin	04/01/96 – 03/31/97	\$13,400
A novel environmental controller to maximize swine thermal comfort	ISU-SPRIG	<b>Xin</b>	Udpa	01/01/97 – 12/31/97	\$7,886
Environment control for livestock and poultry production	MOA, BFE	Dong	<b>Xin</b>	01/01/95 – 12/31/97	\$50,000+
Dietary acid-base treatment on heat stress and the biochemical parameters of turkey breast muscle	ITF	Ahn	Sell, <b>Xin</b>	07/01/96 – 12/31/96	\$2,400
Development of LIFE (Livestock Industry, Facilities and Environment) Ed. Series	ISU – Office of VP for Extension	Glanville	Harmon, Lorimor, <b>Xin</b>	09/01/96 – 08/31/97	\$70,000
Energy savings in swine production through use of energy efficient lighting and heat lamps	Iowa Energy Center	<b>Xin</b>	Bundy	07/01/94 – 06/30/98	\$159,754
Procurement of a state-of-the-art infrared thermal imaging camera	Iowa Energy Center	<b>Xin</b>		07/97	\$11,000
Alleviating long-journey chick stress and subsequent mortality via improved design and microenvironment of transport containers	Hy-Line International	<b>Xin</b>		07/01/94 – 06/30/96	\$31,957
An innovative chick shipping container	CATD	<b>Xin</b>		09/01/95 – 03/31/96	\$14,142
Training of a Russian scholar in animal production systems	RSCHE	<b>Xin</b>		01/05/95 – 12/09/95	\$19,743

*Funded Research Grants/Contracts (in chronological order):*

<b>Project Title</b>	<b>Grantor</b>	<b>PI</b>	<b>Co-PI</b>	<b>Period</b>	<b>Amount</b>
Biophysical models for poultry production system	NE127	<b>Xin</b>		10/01/94 – 09/30/98	\$25,000
Development of an animal environment research laboratory (gift)	Agri-Tech, Inc.	<b>Xin</b>		1994	\$5,040
Responses of poultry to environmental control schemes in cold climates	ISU-COE	<b>Xin</b>		01/17/94 – 05/31/94	\$4,000
Monitoring turkey house air quality in southeast Iowa	ITMC	<b>Xin</b>	Owings, Trampel	05/01/94 – 04/30/95	\$2,000

## ADVISING/MENTORING/HOSTING OF STUDENTS/POST-DOCS/VISITING PROFESSORS

Name	Degree	Thesis Title or Area of Training	Support <sup>\$</sup>	Start	Finish
Acevedo, Ricardo	M.S.	Use of dynamic emission chamber to quantify emissions from high-rise layer houses	G	Aug 08	Aug 10
Chepete, Justin <sup>@</sup>	M.S.	Evaluation of intermittent partial surface wetting to relieve laying hens of heat stress	S/G	Jun 97	May 99
Cook, Rachel <sup>+,%</sup>	M.S.	Effect of cage stocking density on feeding behavior of laying hens	C/G	Aug 03	June 05
Ehr, Isa	M.S. (co-adv)	Production and health responses of poultry to dietary omega-3 fatty acids supplementation	G	Jan 13	Aug 17
Han, Tao	M.S.	Performance and energetics of neonatal chicks as influenced by in-transit lighting	G	Jun 95	May 97
Hu, Jianing	M.S.	Automatic image selection and segmentation of swine thermal comfort behavior	G	Aug 96	Dec 97
Lee, Kichang <sup>*</sup>	M.S.	Characterizing physiological and energetic responses of young chicks to stress relief measures for long-distance air transport	G	Jan 95	May 96
Long, Hongqian	M.S.	Evaluation of LED vs. fluorescent lighting in aviary hen houses	CSC/G	Sept 13	Sept 14
Mendes, Luciano	M.S.	Ammonia emissions of pullets and laying hens as affected by stocking density	G	Aug 08	Aug 10
Ning, Xiaopeng	M.S.	Characterizing ammonia emission dynamics of poultry	G	Aug 06	Dec 08
Pepple, Laura	M.S.	Impact of feeding DDGS to swine: emissions and potential management strategies	G	Aug 09	May 11
Persyn, Kelly <sup>%</sup>	M.S.	Feeding behaviors of pullets and laying hens with or with beak-trimming	C/G	Aug 01	May 03
Yang, Peilin <sup>&amp;</sup>	M.S.	Nitrogen loss from laying hen manure in high-rise layer houses	G	Jun 97	Dec 99
Wilco .J.M. Verhoijzen	M.S. (visiting)	Development of an automated monitoring system for quantification of poultry behaviors	S/G	Aug 14	Dec 14
Ye, Wenyu	M.S.	Quantifying thermal comfort behavior of young pigs using thermography	G	Jan 98	Aug 99
Andersen, Heidi	Ph.D. (visiting)	Automatic climate control of swine houses	S	Sept 05	Dec 05
Chepete, Justin H. <sup>***</sup>	Ph.D.	Determination of heat and moisture production rates of modern poultry and housing systems	G	Aug 99	May 02
Davis, Jeremiah <sup>++,%</sup>	Ph.D.	Monitoring cattle locomotion and ingestion behavior via remote sensing	C/G	Jan 04	Jun 07
Green, Angela <sup>%</sup>	Ph.D.	A systematic evaluation of laying-hen housing systems for improved hen welfare	NSF Fellow/G	Aug 04	Jan 08

## ADVISING/MENTORING/HOSTING OF STUDENTS/POST-DOCS/VISITING PROFESSORS

Name	Degree/ Position	Thesis Title or Area of Training	Support <sup>\$</sup>	Start	Finish
Hayes, Morgan <sup>§</sup>	Ph.D.	Alternative housing systems for laying hens	G	Aug 08	May 12
Leonard, Suzanne	Ph.D.	Enhancing the health and well-being of pre-weaning piglets and sows	G	May 16	
Li, Hong <sup>++</sup>	Ph.D.	Ammonia emissions from manure belt laying hen houses and manure storage	G	Aug 02	May 06
Liu, Kai <sup>§</sup>	Ph.D.	Alternative housing and lighting for pullets and laying hens	CSC/G	Aug 12	Dec 17
Ma, He	Ph.D.	Responses of poultry to lighting intensity	CSC/G	Oct 12	Dec 14
Nakarmi, Akash	Ph.D.	Automated quantification of group-housed laying behaviors (co-advisor with Dr. Tang)	G	Oct 09	May 13
Roberts, Stacey	Ph.D.	Mitigation of ammonia emissions from laying hen houses via dietary manipulation	G	Aug 06	Aug 09
Severo, J. Abreu	Ph.D.	Measurement and mitigation of gaseous and particulate emissions from poultry houses	G	Aug 06	Resigned
Shao, Bin	Ph.D.	Development and evaluation of a behavior-based swine environment controller	G	Jan 98	Dec 03
Shao, Junqing <sup>**</sup>	Ph.D.	Quantification of thermal needs of young pigs by image analysis of postural behavior	D/G	Aug 94	Dec 97
Stinn, John <sup>%%</sup>	Ph.D.	Greenhouse gas emissions from breeding, gestation and farrowing swine facilities	G	Aug 10	Aug 14
Oliveira, Jofran	Ph.D.	Behaviors and performance of laying hens as affected by resource and management in alternative housing	S/G	Aug 15	Jul 19
Tao, Xiuping	Ph.D.	Responses of market-size broilers to acute thermal challenge and surface cooling	G	Aug 01	Jun 02
Wang, Kailao	Ph.D.	Automatically tracking behaviors of individual birds in group settings	CSC/G	Oct 17	
Wang, Yu	Ph.D.	Quantifying and enhancing ventilation performance in cage-free hen housing	CSC/G	Oct 17	
Yanagi, Tadayuki	Ph.D.	Optimization of direct surface evaporative cooling for laying hens	S/0.35G	Jun 00	Feb 02
Zhou, Hongsen <sup>*</sup>	Ph.D.	Behavior-based assessment of thermal needs of piglets from birth to weaning	G	Aug 94	May 98
Li, Hong	Associate Scientist	Quantification and mitigation of air emissions for animal feeding operations	G	Aug 07	Nov 10
Shepherd, Tim	Assistant Scientist	Quantification and mitigation of air emissions for animal feeding operations	G	Nov 10	Aug 14
Zhao, Yang	Assistant Scientist	Measurement of aerial emissions from laying-hen housing systems	G	Jul 15	Dec 16

**ADVISING/MENTORING/HOSTING OF STUDENTS/POST-DOCS/VISITING PROFESSORS**

<b>Name</b>	<b>Degree/ Position</b>	<b>Thesis Title or Area of Training</b>	<b>Support<sup>\$</sup></b>	<b>Start</b>	<b>Finish</b>
Chai, Lilong	Post-doc	Mitigation of air emissions from alternative hen housing systems	G	Oct 15	July 18
Li, Hong	Post-doc	Quantification and mitigation of air emissions from poultry production facilities	G	May 06	Jul 07
Li, Shuhai	Post-doc	Mitigation of air emissions from poultry houses and manure storage	G	Sept 08	Aug 09
Li, Xiwei	Post-doc	Optimizing heating systems for swine production	G	Nov 97	Feb 98
Liang, Yi	Post-doc	Measurement of ammonia emissions from poultry houses	G	Jun 02	July 05
Puma, M.C.	Post-doc	Poultry housing and ingestion behavior	G	Jul 97	June 01
Rahman, S.	Post-doc	Quantification and mitigation of air emissions from poultry houses	G	Mar 06	Jan 07
Tanaka, Akihiro	Post-doc	Improvement of thermal and nutritional conditions during long-distance shipment of day-old breeder chicks	G	Aug 95	Sept 96
Zhao, Yang	Post-doc	Measurement of aerial emissions from laying-hen housing systems	G	Jun 11	Jun 15
Mohd-Ali, Rudy	Research Associate	Measurement of ammonia emission from poultry housing systems	G	Oct 01	Mar 02
Abe, Yoshiyuki	Senior Researcher	Air quality and heat stress relief engineering for livestock production	PDL	Nov 13	Nov 14
Atilgan, Atilgan	Visiting Prof.	Air quality related to animal production operation	PDL	Jan 11	April 11
Atilgan, Atilgan	Visiting Prof.	Means to quantify gaseous and PM concentrations and emissions of animal production facilities	PDL	Aug 14	Jul 15
Chen, Yongxing	Visiting Researcher	Quantification of air emissions from animal production facilities	G	July 11	Dec 11
Chepete, Justin H.	Visiting Prof.	Measurement, modeling and mitigation of air emissions from poultry operations	G	July 09	June 10
Dong, Baocheng	Visiting Researcher	Quantification of air emissions from animal production facilities	G	July 11	Aug 12
Dong, Hongmin	Visiting Prof.	Environment control for livestock and poultry production	0.50PDL 0.50G	Mar 98	Dec 98
Gates, Richard S.	Visiting Prof.	Ingestion behavior of poultry as influenced by nutrition and thermal modifications	0.5PDL 0.5G	Aug 00	July 01
Grebennik, D.V.	Visiting Researcher	Poultry production systems and technologies	G	Jan 95	Dec 95



## ADVISING/MENTORING/HOSTING OF STUDENTS/POST-DOCS/VISITING PROFESSORS

Name	Degree/ Position	Thesis Title or Area of Training	Support <sup>\$</sup>	Start	Finish
He, Jincheng	Visiting Professor	Quantification of animal behaviors through image analysis and wireless sensing	PDL	Oct 13	Oct 14
Ikeguchi, Atsuo	Visiting Researcher	Suppression of aerosols and reduction of heat stress in layer house by misting	G	Apr 98	Oct 98
Lao, Fengdan	Visiting Professor	Quantification of animal behaviors and health status through image analysis	PDL	Aug 14	July 15
Li, Lihua	Visiting Professor	Assessment of poultry behaviors in alternative hen housing systems	PDL	Feb 15	Feb 16
Rossnegal, Alyssa A.	Co-op Researcher	Quantification of ammonia emission from poultry housing systems	G	May 03	Dec 03
Severo, J. C. Abreu	Visiting Researcher	Alternative methods for measuring gaseous emissions from animal production facilities	G	Feb 06	July 06
Tanaka, Akihiro	Visiting Researcher	Quantification of ammonia emission from poultry production facilities	G	Dec 01	June 02
Tang, Xiangfang	Visiting Researcher	Bioenergetics, air quality and animal-environment interactions	G	April 10	Sept 10
Yi, Bao	Visiting Researcher	Animal environment and well-being	G	Jan 18	Jan 19
Zhang, Qiang	Visiting Prof.	Bioenergetics and environmental physiology	0.8PDL 0.2G	Aug 98	Jul 99
Zhao, Deling	Visiting Prof	Animal environment and air quality	PDL	Sept 12	Aug 13
Zheng, Weichao	Visiting Researcher	Air quality in animal housing	CSC	June 12	Oct 12
Zhu, Zhiping	Visiting Researcher	Measurement and mitigation of air emissions from animal housing	G	Jan 06	Sept 06

- \$ S = Scholarship; G = Research Grant (½ RA for grads, full time for post-docs); D = Dept. RA support; C = College RA award; PDL = Professional Development Leave supported by scholar's home institute, CSC = China Scholarship Council  
 + Recipient of the ABE Howard Johnson Outstanding MS Student in Agricultural Engineering Award (2005) and ISU Miller Fellowship (2003-2005); Winner of the ASAE MS Graduate Student Research Award competition (2005)  
 ++ Recipient of Rev P.T. Taiganides Award for Outstanding Ph.D. Students in Agricultural Engineering  
 @ Recipient of the ABE Howard Johnson Outstanding MS Student in Agricultural Engineering Award (1999)  
 \* Co-recipient of an ASAE Superior Paper Award (1997)  
 \*\* Recipient of 1997 Rev P.T. Taiganides Award for Outstanding Ph.D. Students in Agricultural Engineering; and 1997 Mid-Central ASAE Outstanding Graduate Student of the Year Award.  
 \*\*\* Recipient of 2001 "All but Dissertation Award" from the ISU Graduate College; and 2002 Rev P.T. Taiganides Award for Outstanding Ph.D. Students in Agricultural Engineering. Resumed faculty position at the University of Botswana.  
 & Co-advisor with Dr. Jeff Lorimor  
 ♣ Co-recipient of ASAE Superior Paper Award (2000)  
 % Recipient of Henry Giese Structures and Environment Fellowship  
 %% Recipient of Henry Giese Structures and Environment Fellowship (three times); Recipient of ISU 2013 Brown Graduate Student Fellowship (\$10,000); Recipient of ISU 2013 Outstanding Graduate Research Award; Recipient of 2013 Rev P.T. Taiganides Award for Outstanding Ph.D. Students in Agricultural Engineering; Recipient of 2013 ASABE Iowa Section Outstanding PhD Graduate Student Award  
 § Recipient of Iowa State University Outstanding Graduate Research Award; Recipient of 2017 ASABE Iowa Section Outstanding PhD Graduate Student Award

**Current employment/positions of some former advisees:**

- 1) Dr. Yoshiyuki Abe (Visiting Researcher, 2013-2014), Senior Researcher, Agriculture Forestry and Fisheries Research Council, Ministry of Agriculture Forestry and Fisheries, Tokyo, Japan
- 2) Dr. Atilgan Atilgan (Visiting Researcher, 2011 & 2014-2015), Professor and Head, Department of Agricultural Structures and Irrigation, Suleyman Demirel University, Turkey
- 3) Dr. Justin H. Chepete (M.S., 1999; PhD, 2002), Professor and Head, Department of Agricultural and Biosystems Engineering, Botswana University of Agriculture, Gaborone, Botswana
- 4) Dr. Lilong Chai (Postdoc, 2015–2018). Assistant Professor, Department of Poultry Science, University of Georgia, Athens, GA (starting Aug 1, 2018)
- 5) Dr. Yonxing Chen (PhD – joint training, 2012), Assistant Professor, Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agri. Sciences (CAAS), Beijing, China
- 6) Dr. Jeremiah Davis (PhD, 2007), Associate Professor of Agricultural and Biological Engineering and Associate Director of National Poultry Technology Center, Auburn University, AL
- 7) Dr. Hongmin Dong (Visiting Researcher, 1998), Professor and Deputy Director General, Institute of Environment and Sustainable Development in Agriculture, CAAS, Beijing, China
- 8) Dr. Angela Green (PhD, 2008), Associate Professor, Department of Agricultural and Biological Engineering, University of Illinois, Urbana-Champaign, IL
- 9) Dr. Morgan Hayes (PhD, 2012), Assistant professor, Department of Biosystems and Agricultural Engineering, University of Kentucky, Lexington, KY
- 10) Dr. Atsuo Ikeguchi (Visiting Researcher, 1999), Professor of Bioresource Engineering, Utsunomiya University, Tochigi, Japan
- 11) Dr. Kichang Lee (MS, 1996), Research Scientist, Harvard-MIT Division of Health Sciences and Technology, Cambridge, MA
- 12) Dr. Fengdan Lao (Visiting Researcher, 2014-2015), Associate Professor, China Agricultural University, Beijing, China
- 13) Dr. Hong Li (PhD, 2006), Associate Professor, Department of Food and Animal Sciences, University of Delaware, Newark, DE
- 14) Dr. Luciano Mendes (MS, 2010), French Nat'l Institute for Agricultural Research, Clermont-Ferrand Area, France
- 15) Dr. Xiaopeng Ning (MS, 2008), Assistant Professor, Industrial and Management Systems Engineering, West Virginia University, WV
- 16) Dr. Shuhai Li (Postdoc, 2008–2009), Associate Professor, Nanjing Agricultural University, China
- 17) Dr. Yi Liang (Postdoc, 2002–2005), Associate Professor, Department of Biological and Agricultural Engineering, University of Arkansas, Fayetteville, AR
- 18) Dr. Shafiqur Rahman (Postdoc, 2006–2007), Associate Professor, Department of Agricultural and Biological Engineering, North Dakota State University, Fargo, ND
- 19) Dr. Stacey Roberts (PhD, 2009), Poultry Nutritionist, Provimi, Brookville, OH
- 20) Dr. Bin Shao (PhD, 2003), Software Development Engineer, Motorola Company, Chicago, IL
- 21) Dr. John P. Stinn (PhD, 2014), Environmental Services Manager, Iowa Select Farms (the largest swine company in Iowa and ranks 4<sup>th</sup> largest swine company in the US), Iowa Falls, IA
- 22) Dr. Akihiro Tanaka (Post-doc, 2001–2002), Chief Researcher, National Agriculture Research Center for Kyushu and Okinawa Regions, Kyushu, Japan
- 23) Dr. Xiuping Tao (PhD – sandwich program, 2002), Professor, Institute of Environment and Sustainable Development in Agriculture, CAAS, Beijing, China
- 24) Dr. Tadayuki Yanagi, Jr. (PhD – sandwich program, 2002), Professor, Department of Engineering, Associate Provost for Graduate Education, Universidade Federal de Lavras, Lavras, MG, Brazil
- 25) Dr. Yang Zhao (Post-doc/Assistant Scientist, 2011–2016), Assistant Professor, Department of Biological and Agricultural Engineering, Mississippi State University, MS
- 26) Dr. Zhiping Zhu (PhD – sandwich program, 2006), Professor, Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences, Beijing, China

## EXTENSION/OUTREACH PROGRAMS

### **a. Leadership with the Egg Industry Center (2008 – present)**

The Egg Industry Center (EIC, <http://www.eggindustrycenter.org>) was established in 2008, located at Iowa State University. The mission of EIC is *to add value to the egg industry by facilitating research and learning for egg producers, processors and consumers through national and international collaboration*. Dr. Xin has been serving as director of EIC since its inception. EIC is also staffed with a Program Manager-Business Manager, a Communications Specialist and a part-time Office Assistant. A 15-member Advisory Board that consists of egg producers, allied industry representatives, government officials, and academic scientists/administrators provides consultation and guidance about development of the EIC program priorities. EIC had set a goal to establish a \$10 million endowment (private funding) to support its research programs. To date, \$6.1 million has been raised. EIC has been serving the egg industry, academia, government and the general public by:

- Conducting issue-oriented research projects (e.g., highly pathogenic avian influenza or HPAI, hen housing systems, carbon footprint analysis of egg production and processing) and timely dissemination of the research finding;
- Being a research-based clearinghouse for the industry, academia and the general public regarding egg production, procession and consumption;
- Providing up-to-date industry statistics and economic analysis/forecasting. Today, the EIC's monthly reports of egg industry statistics and economic analyses are reaching over 1,250 recipients worldwide.
- Providing Weekly Media Updates on topics germane to egg production, processing and utilization.
- Holding annual egg industry issues forums at various geographical locations in the country (Des Moines, IA; Chicago, IL; Columbus, OH; Denver, CO; St Louis, MO; Indianapolis, IN) to address current and emerging issues that affect the egg industry and the consumers.
- Funding research/extension/educational efforts to address current and emerging issues. To date EIC has either jointly or solely funded a number of multi-state, multi-disciplinary projects concerning impact of alternative hen housing systems, environmental footprint assessment of egg production, and egg safety associated with various housing types.
- Developing/facilitating national and international partnerships and collaborations to address issues that are commonly facing the egg industry, e.g., American Egg Board (AEB), United Egg Producers (UEP), and International Egg Commission (IEC).

The EIC extension/educational deliverables are distributed to more than 1,250 national and international recipients covering egg producers (>90% U.S. egg producers) and companies, allied industries (breeder, equipment), government agencies, and researchers and extension personnel in academia. Although EIC is physically located at ISU, its programs and activities are national and international in nature.

### **b. Leadership of ABE Extension Program in Serving the Poultry Industry (with official extension appointment from Dec 1993 to March 2017)**

Dr. Xin led ABE departmental extension program in serving the state, regional and national poultry industry. He had conducted the following extension/outreach programs.

- Providing leadership at the national level in addressing environmental (air quality) issues facing the egg industry. For instance, Dr. Xin has been serving as the chair of the United Egg Producers Environmental Scientific Panel (ESP) since 2004 (UEP represents over 90% of the U.S. egg producers). The missions of ESP are a) to serve as the clearinghouse for the egg industry regarding environmental issues related to egg production and state of science on environmental research; and b) to explore practical means and make recommendations on best management practices to improve indoor air quality and mitigate air emissions of egg production facilities. The 14-member ESP consists of leading university researchers (Iowa State University, Pennsylvania State University, Purdue University, University of Illinois, The Ohio State University), allied industry representatives, producer representatives, and government agency (USDA). As a result of the ESP's collective effort, a USDA-CIG project completed in 2010 in Iowa and Pennsylvania demonstrated that use of dietary manipulation is a viable means to mitigate ammonia (major noxious gas in

poultry houses) emissions and improve manure nutrient contents for laying-hen houses. The mitigation technology has been adopted by egg producers.

- Conducting educational programs on issues of animal (particularly poultry) production air quality, environmental control and production sustainability via invited and participatory presentations at local, regional, national and international extension workshops and symposia.
- Providing technical consultation to animal (poultry in particular) producers and allied industries regarding engineering and management issues related to animal production.
- Serving on board of directors or advisory councils for commodity groups (e.g., Iowa Egg Council, Iowa Poultry Association, Iowa Turkey Federation, United Egg Producers, American Egg Board, National Pork Producers Council) and governmental agencies (USDA)
- Integrating emerging animal industry issues into applied research/demonstration projects, which have led to timely, research-based solution or information, therefore significant impacts on the livestock and poultry industries at state and national levels. Examples of such integrated projects include:
  - Quantification and mitigation of air emissions from poultry production operations
  - Improving the quality and efficiency of shipping poultry and swine breeder stocks worldwide
  - Devising cost-effective methods for combating summer heat stress in commercial laying hen houses
  - Establishing research-based data on manure nutrient production from laying hen facilities, which have been adopted in the state (IDNR) guidelines for developing manure management plans.
  - Improving energy efficiency of creep heating and microenvironment in the swine farrowing operation
  - Helping an Iowa-based swine equipment manufacturing company to improve design and quality of heat mat for creep heating
  - Assisting equipment manufacturers in developing heat mat and controllers for swine creep heating
  - Field demonstration of dietary manipulation to reduce ammonia emissions while maintaining or enhancing production efficiency for laying-hen operations
- Developing and maintaining strong partnerships/network with state and national commodity groups, inter-state institutional and governmental agencies to enhance outreach programs
- Supporting agricultural engineering field specialists, as needed, in carrying out their extension programs. The support is in the form of annual in-serve training, collaboration on field demonstration projects, and answering technical questions.
- Producing/contributing to over 60 extension publications, media reports and popular press articles

## SERVICE

### a. University, College and Departmental Committees

- ISU New Poultry Research and Teaching Facility Planning Committee (Chair, 2017–2019)
- University Conflict of Interest Management Committee (2016–2019)
- University Distinguished Professor Nominations Review Committee (2016–2018)
- Search Committee for the ISU Vice President for Research (Sept–Dec 2013)
- University Graduate Faculty Term Membership Review Committee (2003–2006)
- College of Agriculture and Life Sciences (CALS) Air Quality Issue Team (2003–present)
- CALS Avian Influenza Issue Team (2006–2010)
- CALS Distinguished Professor Screening Committee (2015)
- CALS Diversity Committee (1997–2001; 2009–2010; 2010–2011)
- CALS Promotion and Tenure Advisory Committee (2003–2006)
- CALS New ISU Poultry Farm Planning Committee (Chair, 2017–)
- College of Engineering Committee on Research Strategy (2012–2015)
- College of Engineering Honors and Awards Committee (2007–2010)
- College of Engineering Promotion and Tenure Committee (2007–2010, 2012-subbing)
- College of Engineering Graduate Education Task Force Committee (2003–2005)

- College of Engineering Research Award Committee (1998–2002; 2011– 2014)
- College of Engineering Honors and Awards Committee (2004–2007; 2007–2010)
- ABE ad-hoc faculty search committees
- ABE Awards Committee (2016)
- ABE Department Research Council (2016–)
- ABE Agricultural Engineering Research Center (AERC) Committee (2000–2001)
- ABE Animal Production Systems Engineering Focus Group Leader (2003–2009)
- ABE Awards and Publicity Committee, Chair (2007–2008)
- ABE Chair Advisory Committee (2004–2009)
- ABE CSREES Academic Review Executive Committee (2003–2004)
- ABE Diversity Committee (2009–2010; 2010-2011), Chair (2009–2010)
- ABE Director of Graduate Education (DOGE) (2003–2005)
- ABE Graduate Programs Committee (1994–2008; Chair, 2003–2005; 2012–2013; 2013–2014; 2014–2015; 2015–2016; 2016–2017)
- ABE-IEdT ad-hoc merger committee (2003–2004)
- ABE New Building Feasibility Study and Planning Committee (2004–2012)
- ABE International Programs Committee (1997–2003; 2010-2011; 2011-2012; VC 2011–2013; 2013–2014; 2014–2015)
- ABE junior faculty mentor (Dr. Stuart Birell, 1998-2001; Dr. Jacek Koziel, 2004–2006; Dr. Kurt Rosentrater, 2011–2015)
- Faculty mentor for Dr. Yuko Sato, assistant professor of VDPAM, CVM (2015–)
- ABE Professional Development and Awards Committee (1997–2008, Chair 2004–2005)
- ABE Promotion and Tenure Review Committee (1995-1996; Chair 2003–2004; 2005–2006; 2010–2011; 2011–2012; 2014–2015)
- ABE Space Advisory Committee, Chair (2011–2013)
- AnSci Animal Industry Report, Editor on Poultry Section (2010–present)
- AnSci Poultry Nutrition Faculty Search Committee (2009)
- AnSci Poultry Nutrition Faculty Search Committee (2014)
- GPSA (Grad Program in Sustainable Ag) Admissions Committee (2000–2005)
- VDPAM Poultry Faculty Search Committees (2015, 2017)

**b. Professional/Government/Commodity Organizations**

- World Wildlife Fund (WWF) and the Rockefeller Foundation Protein Research Group (2018–)
- Member of Advisory Panel for World Wildlife Fund Study on Canadian Egg Sustainability (2017)
- Member of Advisory Panel for World Wildlife Fund Study on U.S. Egg Sustainability (2017)
- Invited member of the Assessment Committee for a Precision Livestock Farming faculty search at the Catholic University of Leuven, Belgium, appointed by the KU Leuven Academic Board (2016)
- Overseas Chair, Board of Directors for the International Research Center for Animal Environment and Welfare (IRCAEW) headquartered at Chongqing Academy of Animal Sciences, Chongqing, China (2012–2016; 2016–2020)
- Co-chair of the International Symposium on Animal Environment and Welfare sponsored by the International Research Center for Animal Environment and Welfare ([www.ircaew.org](http://www.ircaew.org)), Oct. 22-24, 2011; Oct. 19-22, 2013; Oct 23-26, 2015; Oct. 23-26, 2017; Chongqing, China
- Co-chair of the First Asian Precision Livestock Farm Conference (1<sup>st</sup> PLF-Asia) sponsored by the International Research Center for Animal Environment and Welfare, China Agricultural University, September 9-11, Beijing, China
- An invited member of 24-member United Egg Producers Strategic Planning Committee (2017)
- Member of the UEP Scientific Advisory Committee on Animal Welfare (2012–present)
- Member of the United Egg Producers Ammonia Task Force (2013–present)

- Member of the National Pork Producers Council Air Science Committee (2011–present)
- Member of the American Egg Board Science Advisory Committee on Production (2010–present)
- Ex-officio Board Member of the Iowa Egg Council (2008–present)
- Ex-officio Board Member of the Iowa Turkey Federation (2008–2010)
- Chair of United Egg Producers Environmental Scientific Panel on Air Emissions (2004–present)
- Director of Egg Industry Center located at Iowa State University (2008–present)
- Member of the USDA Agricultural Air Quality Task Force (AAQTF) (2008–2015, three terms)
- Member of the USDA-NRI Air Quality Program Review Panel (2007)

#### ***ASABE (American Society of Agricultural and Biological Engineers)***

- Member of E-05/3 Digitalization Strategy Committee (2018–)
- Planning Committee for the 10<sup>th</sup> International Livestock Environment Symposium (2016–2018)
- Planning Committee for the 9<sup>th</sup> ILES (2010–2012)
- Program Chair of the 8<sup>th</sup> ILES (2006–2008)
- Planning Committee Member and Local Host Co-chair for 7<sup>th</sup> ILES (2003–2005)
- Program Chair of the Structures and Environment (SE) Division (2002–2005)
- Associate Editor of SE Division (1994–2004; 2009–2011)
- SE Representative of the Meetings Council (2003–2006)
- Publications Council - SE Representative (1999–2002)
- P-511 Refereed Publications, SE Liaison (1996–1999)
- SE-04 Paper Awards (Chair, 1996–1997; Vice Chair, 1995–1996; Secretary, 1994–1995)
- SE-301 Environmental Physiology (Chair: 1996–1997; Vice Chair: 1995–1996; Sec: 1994–1995)
- SE-302 Environment of Animal Structures (Chair: 1998–1999; Vice Chair: 1997–1998; Sec: 1996)
- SE-405 Poultry Housing Systems (Chair, 2001; Vice Chair, 2000; Secretary, 1999–2000)
- P-511 Refereed Publications, SE Liaison (1996–1999)
- Coordinator for numerous technical sessions at the annual international meetings.

#### ***ASHRAE (American Society of Heating, Refrigerating and Air-conditioning Engineers)***

- Chair of TC 2.2 Handbook Committee (2000–2003)

#### ***CIGR (International Commission of Agricultural Engineers)***

- Co-chair of the International Symposium on Environment, Health and Animal Welfare, Oct. 19–22, 2011, Chongqing/Rongchang, Sichuan, China
- Organizing Committee member and Proceedings Co-chair of CIGR Section II Working Group Workshop on “*Animal Housing in Hot Climates*”, Oct 22–25, 2009, Chongqing, China
- Editorial Board Member for CIGR e-Journal (2000–present)

#### ***Association of Overseas Chinese Agricultural, Biological and Food Engineers***

- Member of Board of Directors (2001–2005); Vice President (2002–2003)

#### ***Regional Research Project: NE127 - Biophysical Models for Poultry Production Systems***

- Chair (1998–99; 2005–2006); Senior Executive Officer (1997–98; 2004–2005); Junior Executive Officer (1996–97; 2003–2004)
- Co-Chair of committee for project renewal for the period of Oct 1999 to Sept 2004

#### ***Manuscript and Proposal Review:***

- Regular reviewer of ASABE, ASHRAE, CSAE (Canadian Society of Agricultural Engineers), CIGR, Poultry Science, Applied Poultry Research, Animal Science, World Poultry Science, and USDA-ARS technical papers, averaging 8 to 10 papers per year.
- Ad-hoc reviewer of research proposals for USDA Small Business Innovation Research (SBIR) program, National Research Initiative (NRI) program, BARD, international research institutes or agencies, domestic foundations, universities, and industry companies.

c. Graduate Program Committee Member

<b>Name</b>	<b>Degree Sought</b>	<b>Department</b>	<b>Period</b>
Davies, Simmon	Ph.D.	ABE	June '96 – July '97
Green, J.J.	M.S.	AnSci	Aug '09 – July '11
Hansen, Hannah	M.S.	FSHN	Aug '13 – May '15
Heubner, Minda	M.S.	ABE	Aug '02 – Aug '04
Johnson, Jay	Ph.D.	AnSci	Jul '10 – May '14
Kang, Juhyon	M.S.	FSHN	Aug '10 – Dec '12
Kang, Juhyon	Ph.D.	FSHN	Jan '13 – July 2015
Liu, Lei	M.S.	FSHN	June '96 – May '99
Lo, Miranda	M.S.	ABE	Jan '05 – May '06
Roberts, Stacey	M.S.	AnSci	Aug '04 – May '06
Ramirez, Brett	Ph.D.	ABE	Aug '14 – Dec '17
Swestka, Randy	M.S.	ABE	Jan '09 – May '10
Wu, Wei	M.S.	AnSci	Aug '04 – June '06
Yang, Peilin	Ph.D.	ABE	Jan '00 – July '02
Yu, Naiwen	Ph.D.	ABE	Jan '95 – Dec '98

## INTERNATIONAL PROGRAMS AND ACCOMPLISHMENTS

Dr. Xin has been actively engaged in fostering and conducting collaborations with leading international institutions, capacity building, and creating opportunities for graduate students and faculty to get connected with international peers. These activities have contributed to enhancing the global impacts of Iowa State University. Listed below are a few examples of such international activities and impacts.

### Academic Collaborations and Capacity Building with International Institutions

- Since 1996 Dr. Xin has been conducting academic collaborations and capacity building with the Chinese Academy of Agricultural Sciences (CAAS) and China Agricultural University (CAU) in the areas of air quality, animal production systems, environmental control, and animal welfare. The collaborations have been in the forms of conducting educational workshops/symposia at CAAS and CAU, exchange of faculty, joint training of CAAS and CAU graduate students – especially PhD students (in Beijing and at ISU), joint research projects funded by USDA-Foreign Agricultural Service, China Ministry of Agriculture, and China Ministry of Science and Technology, and technical publications in international journals. A special accomplishment of the collaboration with CAAS is the establishment of a China-US Agro-environmental Center of Excellence (CUACE) based at CAAS in Beijing since 2002. The first of its kind in China, the center has been serving as the clearinghouse and think-tank for developing national policies and plans on environmental issues and sustainable animal production in China. Working closely with Professor Hongmin Dong, Director of the center and Deputy Director General of the institute, Dr. Xin was instrumental to the development and implementation of the center's mission and goals. An example of the collaborative endeavors is the project on "Evaluation of Greenhouse Gas Emissions Reduction through Use of Biogas Digesters for Swine Manure" jointly funded by the U.S. EPA (Global Methane-to-Market Program) and China Ministry of Agriculture. Since 1996 Dr. Xin has been holding the title of Honorary Professor of CAAS and CAU. He has been serving on the Scientific Advisory Committee of the CAU Key Laboratory on Agricultural Structures and Environment. To date, Dr. Xin has participated in/contributed to advising of more than 30 graduate students at CAAS and CAU. A formal MOU between CAU and ISU was signed at CAU in 2015 by ISU President Steven Leath and CAU President Ke Bingsheng. Dr. Xin facilitated the MOU signing process.
- Since 1998 Dr. Xin has been conducting academic collaborations and capacity building with two Brazilian universities, Federal University of Viçosa (UFV) and the Federal University of Lavras (UFL) in the areas of animal production environment and animal welfare. In addition, over the past 10+ years Dr. Xin has expanded the academic engagement with the University of Campinas. Once again, the collaborations take the forms of educational workshops at UFV and UFL, reciprocal visits of faculty, joint training of Brazilian undergraduate and graduate students (in Brazil and at ISU), joint research and educational projects funded by US and Brazilian agencies, and joint publications. Between 2002 and 2012, Dr. Xin served as co-advisor or committee member for more than 10 graduate students at UFV through a Sandwich Program. During the period of 2004-2008, through a competitive grant funded by the US Department of Education (FIPSE) and the Brazilian CAPES Foundation, a US-Brazil Educational Consortium was established to train U.S. and Brazilian undergraduate students in agricultural and biosystems engineering, and Dr. Xin served as the ISU project director (in collaboration with University of Kentucky). Through the consortium project, 14 ISU undergraduate students studied at UFV and 14 Brazilian students studied at ISU for one semester. During the project period, Dr. Xin engaged the exchange Brazilian undergraduate students in research projects in his lab. The feedbacks from both ISU and Brazilian students were extremely positive. Subsequently a new FIPSE-CAPES project was awarded (2009), allowing the successful academic exchange/collaborations to continue.
- In 2011 Dr. Xin, together with Dr. Max Rothschild (Distinguished Professor of Animal Science), co-led the ISU Ensminger Exchange Program Team (6 members) to China, where the team conducted academic changes in Beijing (Chinese Academy of Agricultural Sciences – Institute of Animal Science) and Huazhong Agricultural University (Wuhan City). The exchange program enhanced the existing academic collaborations and planted seed for future, long-term academic cooperation/collaboration, particularly among young scientists from both sides.



- In October 2011, at the invitation of the Chongqing Academy of Animal Sciences (China), Dr. Xin played a key role in establishing the International Research Center for Animal Environment and Welfare headquartered in Chongqing ([www.ircawe.org](http://www.ircawe.org)). The purposes of the Center are: First, utilize research capabilities and resources of Chinese and international scientists and institutions, synthesize successful experience and proven management practices, and apply new technologies from various countries to advance the knowledge and technologies in animal environment and welfare worldwide. Second, provide a platform for global networking and exchange to advance animal environment research, improve animal health and welfare, production efficiency and product quality, and ultimately improve the quality of life for mankind. The current 20 participating institutions are: China Agricultural University, Chongqing Academy of Animal Sciences, Northeastern Agricultural University, Nanjing Agricultural University, South China Agricultural University, Iowa State University, Purdue University, University of Illinois, University of Missouri, University of Tennessee, The Ohio State University, North Carolina State University, University of Manitoba (Canada), University of Southern Queensland (Australia), Wageningen University (The Netherlands), Aarhus University (Denmark), Catholic University of Leuven (Belgium), University of Campinas (Brazil), University of Milan (Italy), and Josip Juraj Strossmayer University of Osijek (Croatia). More institutions are expected to join the Center. Dr. Xin was appointed as the Overseas Co-chair of the inaugural BOD, along with Dr. Baoming Li of CAU as the Chinese Co-chair for a 4-year term. In 2016 Dr. Xin was reappointed for another 4-year term as the Overseas Co-chair. Since 2011, every odd-number year, an International Symposium on Animal Environment and Welfare has been held in October (2011/2013/2015/2017/2019), and every even-number year a smaller-scale workshop has been held (2012/2014/2016/2018). Working with the local hosts, Dr. Xin has been responsible for organizing and coordinating the symposia and workshops.
- Since the late 90's Dr. Xin has been collaborating with Professor Daniel Berckmans at the Catholic University of Leuven (KUL), Belgium in quantification and modeling of physiological, energetic and behavioral responses of animals to biophysical factors, and recently on precision livestock farming (PLF). Students and faculty exchanges between ISU and KUL have taken place; and special symposia have been held. During the period 2011-2015, Dr. Xin served as a foreign advisor on the EU-PLF Project (€6 million) led by Professor Berckmans.
- From 2000 to 2013, Dr. Xin collaborated with Professor Christopher Wathes of the United Kingdom, first at Silsoe Research Institute (prior to 2006) and later at the Royal Veterinary College of University of London (2006-2013), in the areas of physiological and behavioral responses of animals to multiple thermal and gaseous stressors. One of Dr. Xin's former PhD students (Angela Green who is now on faculty at University of Illinois Urbana-Champaign) spent six months (Jan–June 2005) at SRI conducting animal welfare research. Reciprocal visits by Drs. Wathes and Xin were made and joint technical publications produced. Professor Wathes retired in 2013, and sadly passed away in 2016.
- During the period of 2006-2010 Dr. Xin was the U.S. member of an international research team (14 institutions), funded by the French Environment and Energy Agency (Dr. Paul Robin, France, Project Director), to develop international reference methods for measuring air emissions from livestock and poultry production systems. The reference methods have been disseminated to researchers and professionals worldwide for determining air emissions from animal production systems, so that the results are more comparable from country to country.
- Dr. Xin has conducted collaborative research with the National Institute of Animal Industry of Japan (Dr. Atsuo Ikeguchi, now professor at Utsunomiya University) in indoor air quality and welfare of poultry and swine as affected by biophysical factors. Reciprocal visits by Drs. Ikeguchi (6 months) and Xin (1 month) were conducted and journal articles have been published. At the recommendation of Dr. Ikeguchi and Dr. Tanaka (Dr. Xin's former post-doc, now Chief Researcher at NARO, Japan), Dr. Yoshiyuki Abe, Senior Researcher at National Agriculture and Food Research Organization (NARO, Japan) – Institute of Livestock and Grassland Science conducted research in Dr. Xin's lab (Nov 2013 – Nov 2014).

**International Reputation and Honors**

- Since 1994 Dr. Xin has delivered more than 70 invited talks at overseas international conferences or symposia in Belgium, Brazil, Canada, China, Columbia, Costa Rica, Denmark, France, Germany, Italy, Japan, Mexico, Spain, The Netherlands, and United Kingdom.
- Dr. Xin has hosted/mentored international visiting scientists/scholars/delegates from Africa, Australia, Belgium, Botswana, Brazil, Canada, China, Denmark, Germany, Greece, Japan, Korea, Morocco, Russia, The Netherlands, Turkey, United Kingdom, and Vietnam.
- Invited member of the Assessment Committee for a Precision Livestock Farming (PLF) faculty search at the Catholic University of Leuven, Belgium, appointed by the KU Leuven Academic Board (2016)
- Appointed as a founding member of the Global Expert Group on Avian Influenza, International Egg Commission (2015–)
- Appointed as a founding member of the Global Roundtable for Sustainable Egg Production, International Egg Commission (2015–)
- Invited to serve on the Scientific Advisory Committee for the Science and Information Centre for Sustainable Poultry Industry [Wissenschafts-und Informationszentrum Nachhaltige Geflügelwirtschaft (WING)], Raum, Germany (2013–present)
- Appointed to Overseas Co-chair of the Board of Directors for the International Research Center for Animal Environment and Welfare headquartered at the Chongqing Academy of Animal Sciences, Rongchang, Chongqing, China (2012–2016; 2016-2020)
- Appointed to the Scientific Advisory Committee for the Key Laboratory of Energy Conservation and Waste Management of Agricultural Structures, Ministry of Agriculture, China (2012–2017)
- Appointed to the Scientific Advisory Committee of the State Key Laboratory in Animal Nutrition (SKLAN), the Chinese Academy of Agricultural Sciences, Beijing, China (2011–2015)
- Appointed to the Scientific Advisory Committee for the Key Laboratory on Agricultural Structures and Environment at China Agricultural University, Beijing, China (2008–2011; 2011–2016)
- Invited Member of the Foreign Scientific Advisory Committee on an European Precision Livestock Farming Project (2013–2016, €5,000,000)
- External examiner of PhD dissertation and defense exam for University of Kwazulu-Natal, South Africa (2009), Catholic University of Leuven, Belgium (2015, 2017), and Wageningen University, The Netherlands (2016)
- Co-chair of the 2019 International Symposium on Animal Environment and Welfare (ISAE2019) sponsored by the International Research Center for Animal Environment and Welfare (IRCAEW), Oct 21-23, 2019; Chongqing, China
- Co-chair of ISAE2017 sponsored by IRCAEW, Oct 23-26, 2017; Chongqing, China
- Co-chair of ISAE2015 sponsored by IRCAEW, Oct 23-25, 2015; Chongqing, China
- Co-chair of ISAE2013 sponsored by IRCAEW, Oct 20-22, 2013; Chongqing, China
- Co-chair of ISAE2011 sponsored by IRCAEW, Oct 22-24, 2011; Chongqing, China
- Keynote speech on “*The changing egg industry*” at National Symposium on Animal Environment and Precision Animal Husbandry, Sept 3-5, 2018, Harbin, China
- Keynote speech on “*Modeling of ventilation shutdown in layer houses*” at the International Egg Commission 2015 Global Leadership Conference, 20-24 September, 2015, Berlin, Germany
- Keynote speech on “*Environmental control for poultry production*” at the 16<sup>th</sup> China National Poultry Science Symposium, May 13-15, 2013; Yangzhou, China
- Keynote speech on “*State and R&D opportunities of U.S. egg industry and the role of Egg Industry Center*” at the Joint Conference of Chinese Association of Animal Science and Veterinary Medicine and Chinese Society of Agricultural Engineers on Eco-environment and Sustainable Livestock Production, Nov 2-5, 2012, Beijing, China
- Keynote speech on “*Environmental footprint of the egg – dramatic progress over the past 50 years*” at the 2012 International Egg Commission Annual Conference held in London, UK, Sept 10-13, 2012.

- Keynote speech on “*Trend and R&D Opportunities of Laying-Hen Housing Systems*” at the XXIV World’s Poultry Congress, August 5-9, 2012, Salvador, Brazil
- Keynote speech on “*Toward standardization of data collection, analysis and presentation of AFO air emissions*” at the Ninth International Livestock Environment Symposium, July 9-12, 2012, Valencia, Spain
- Member of Planning Committee for the Ninth International Livestock and Environment Symposium (ILES IX), July 8-12, 2012, Valencia, Spain
- Keynote speaker on “*Toward sustainable development of egg industry and the role of Egg Industry Center*” at the International Symposium on Egg Industry, June 18-19, 2012, Beijing, China
- Member of the Organizing Committee for the World Poultry Congress XXV, September 5-9, 2016, Beijing, China
- Keynote speaker on “*A balance approach to animal welfare issues to avoid unintended consequences*” at the International Symposium on Health Environment and Animal Welfare co-sponsored by CIGR and China Agricultural University, October 20-22, 2011, Chongqing, China
- Invited to “Mission 2050 Think Tank, Net Zero: *Emissions, Water & Energy*” Forum sponsored by the Ontario Ministry of Agriculture, Food and Rural Affairs and the University of Guelph (2009)
- Member of Organizing Committee and Proceedings Co-chair of the CIGR-Section II Working Group Symposium “*Animal Housing in Hot Climates*”, Oct 22-25, 2009, Chongqing, China
- Program Chair of the Eighth International Livestock and Environment Symposium (ILES VIII), Sept 1-4, 2008, Iguassu Falls, Brazil
- Guest Professor, Zhejiang University (2010–present)
- Adjunct Professor of China Agricultural University (2008–present)
- Co-chair of Local Host Committee for the Seventh International Livestock and Environment Symposium (ILES VII), May 18-21, 2005, Beijing, China
- Honorary Scientist of the Rural Development Administration of the Republic of Korea (2004–2006)
- Honorary Professor of the Chinese Academy of Agricultural Sciences, Beijing China (1998–present)
- Honorary Professor of China Agricultural University (1996–present)
- Research Award for Foreign Expert, Ministry of Agriculture, Forestry and Fisheries, Japan (2000)

## **OTHER SIGNIFICANT CONTRIBUTIONS**

### **Courses Taught or Guest-lectured** (*Dr. Xin has no official teaching appointment*)

- AnSci501 – *Graduate Seminar* (guest lectures on U.S. egg industry, 2010-2015)
- AnSci233 – *Poultry Production* (guest lectures, spring & fall 2016 & 2017, spring 2018)
- AE/TSM601 – *Seminar* (co-taught with Dr. Ramesh Kanwar), fall 2007, fall 2008
- AE572 – *Design of Environmental Systems for Ag Structures* (taught half), spring 1999
- AE214 – *Environmental Engineering for Grain and Animal Systems* (guest lectures)
- AST474/TSM327 – *Livestock Housing Systems* (guest lectures, every fall semester since 2009)
- AE409 – *Engineering Quantification of Biological Processes* (guest lectures)
- SusAg515 – *Integrated Crop and Livestock Production Systems* (guest lecture – fall 2015)
- Engineering Honors Students Workshops (summer 2001)
- Mentoring of PIPELINE programs honor students (summer 2001)

### **Research and Instruction Laboratories Developed**

- Livestock Environment and Animal Physiology Research Laboratory I (LEAP I) (1994)
- Livestock Environment and Animal Physiology Research Laboratory II (LEAP II) (2000)
- Bio-imaging and Measurement Laboratory (2000)
- Four mobile laboratories for measurement of air emissions from animal feeding operations (2005–2011)
- Layer Housing and Behavior Research Laboratory (2015)