Richard S. Gates

Professor

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**Education**

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| Ph.D. | Biological Engineering, Cornell University | 1984 |
| M.S. | Agricultural Engineering, Cornell University | 1980 |
| B.S. | Agricultural Engineering, University of Minnesota | 1978 |

**Professional Experience**

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| Professor, Agricultural and Biological Engineering, University of Illinois at Urbana-Champaign | 2008-present |
| Chair, Biosystems and Agricultural Engineering, University of Kentucky  | 2002-2007 |
| Graduate Faculty, Faculty of Agricultural Engineering, Federal University of Viçosa | 2001-present |
| Professor, Biosystems and Agricultural Engineering, University of Kentucky  | 1996-2008 |
| Associate Professor, Biosystems and Agricultural Engineering, University of Kentucky | 1990-1996 |
| Assistant Professor, Biosystems and Agricultural Engineering, University of Kentucky | 1985-1990 |
| Senior Research Support Specialist, Cornell University | 1984-1985 |
| Senior Systems Analyst, Cornell University | 1983-1984 |

**Current Research Interest**

Research includes controlled environment systems research, with emphasis on biological and physiological responses and interactions between occupants and environment; controlled environment systems analysis, control and simulation; dietary manipulation in poultry and livestock for reduced aerial gases and building emissions; poinsettia propagation and hydroponic lettuce; control systems development including fuzzy logic, heuristics and vapor pressure deficit; livestock production models for real-time economic optimization.

**Current Teaching**

Teaching undergraduate and graduate courses in probability and statistics, thermal environmental engineering, controlled environment systems, structures and environment, psychrometrics, instrumentation, data acquisition and control, instrumentation, linear and nonlinear systems optimization.

**Courses:**

ABE 100 – Introduction to Agricultural & Biological Engineering

TSM 311 – Humanity in the Food Web

TSM 371 – Residential Housing Design

TSM 199 – Introduction to CAD

Advisor – for 33% of entering freshman and sophomores in ABE annually

**Current Extension and Consulting**

Extension and consulting related to applications of research, including air emissions and mitigation, greenhouse and livestock environment control systems and livestock heat stress reduction.

**Awards**

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| Fellow, American Society of Agricultural and Biological Engineering (ASABE)Presidential Citation for “*Dedicating an Extraordinary Amount of Time and Effort to Ensure a Successful and Effective International Livestock Environment Symposium*”, American Society of Agricultural and Biological Engineers  | 20102009 |
| ASABE Honorable Mention Paper Award for Ammonia Emissions from Two Empty Broiler Houses with Built-up Litter | 2009 |
| Presidential Citation for Leadership in Chairing the International Livestock Environment Symposium VIII, American Society of Agricultural and Biological Engineers (ASABE) |  2008 |
| Henry Giese Structures and Environment Award, American Society of Agricultural and Biological Engineers (ASABE) | 2006 |
| ASABE (ASAE) Superior Paper Awards | 2014, 2013, 2005, 2004, 1996, |
|  | 1995, 1989, 1987 |
| ASHRAE Best Poster Award | 1995 |
| Outstanding Teacher Award, College of Engineering, Tau Beta Pi, and Department of Agricultural Engineering, University of Kentucky | 1995 |

**Professional Organization Membership**

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| Registered Professional Engineer: KY PE-14892  | 1987-present |
| American Society of Agricultural and Biological Engineers (ASABE) | 1986-present |
| American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) | 1995-present |
| International Federation of Automatic Control (IFAC)  | 1995-present |
| International Commission of Agricultural Engineering (CIGR)  | 1986-present |
| Poultry Science Association (PSA)  | 1988- present |
| World Poultry Association (WPA)  | 2001-present |
| Council for Agricultural Science and Technology (CAST) |  1997-2002 |

**Professional Society Activity**

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| ASABE Board of Directors | 2008-2010 |
| CIGR Section 2, Farm Buildings, Systems, Structures and Environment, Board Member – 1 of 2 American representatives | 2002-present |
| ASAE Associate Editor, Structures and Environment Division | 2000-2002 and 1990-1995  |
| ASAE Nominating Committee  | 1999-2001 |
| ASAE Technical Committee SE-301 Environmental Physiology | 1987-present |
| ASAE Technical Committee SE-302 Greenhouse Environment Chairman Vice Chair Secretary | 1999 1998 1997  |
| ASAE SE-405 Poultry Housing Systems (twice through officer rotation) | 1987-present |
| ASHRAE Technical Committee 2.1 Plant and Animal Environments  (Chair, Project Monitoring Subcommittee on $125,000 grant to obtain Modern Poultry Heat and Moisture Production relations) | 1995-present1999-2003 |
| Bluegrass Chapter of ASHRAE: past officer, Board of Governors  | 1998-2000 |
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**Honor Society Membership**

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| Gamma Sigma Delta (Agriculture) | 1990-present |
| Sigma Xi (Research) | 1982-present |
| Alpha Epsilon (Agricultural Engineering) | 1977-present |

**Patent**

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| --- | --- |
| Timmons, M.B. and R.S. Gates. Method for controlling environment conditions of living organisms based upon time integrated variables. U.S. Patent Office Patent Number 5,573,199. | 1995 |

## Consulting

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| National Pork Producers Council  | Des Moine, IA | 2011-12 |
| American Egg Board, National Pork Producers Council Independent Reviewer for National Air Emissions Monitoring project (US EPA Air Consent Agreement)Iowa State University | Ames, IA | 20091999, 2001 |
| Heartland Pork Enterprises | Iowa Falls, IA | 2000-2002 |
| Cargill’s Shady Brook Farms | Dayton, VA | 2003 |
| The Hanor Company | White Hall, IL | 1999 |
| AMBIAGRO – Nucleó de Pesquisa em Ambiencia e Arquitetura de Sistemas Agro-Industrais, Federal University of Viçosa (UFV), Departamento de Engenharia Agrícola UFV | Viçosa, Brazil | 2002-2008 |
| Research Concepts, Inc. | Lenexa, KS | 1992-1999 |
| Ajinomoto-Heartland, Inc. | Chicago, IL | 1998-2004 |
| North Carolina State University | Raleigh, NC | 1995 |

## Sabbatical Leaves

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| Iowa State University, Department of Agricultural and Biosystems, Ames IA | August 2000- July 2001 |
| University of Natal, Pietermaritzburg, South Africa Agricultural University of Athens, Greece Kitasato University, Towada-Shi, Aomori Japan | January-August 1993 |

## Public Service Activities

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| University of Kentucky Liaison for cooperative agreement between University of Kentucky and the Federal University of Viçosa, Brazil. This agreement provided a framework for exchange of students and faculty. The agreement was signed in September 2001 in Viçosa, with subsequent faculty and staff visits in 2002-2008. Subsequently served as external examiner or co-advisor for three dissertations and six M.S. projects.*Review manuscripts for:* |
| Transactions of the ASABE/ASAE | annually |
| Journal of Applied Engineering in Agriculture | annually |
| Journal of Applied Poultry Research | annually |
| ASHRAE Transactions | periodically |
| Scientia Agrícola (Brazil) | annually |
| IEEE CSM | 2002 |
| Computers & Electronics in Agriculture | periodically |
| Acta Horticultura  | periodically |

*Review research proposals for:*

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| USDA Agricultural Research Service (Panel Manager)USDA Small Business Innovative Research (SBIR) | 20101997-2008 |
| USDA National Research Initiative (NRI) Competitive Grants Program |  Annually  |
| U.S.-Israel Bi-National Agricultural Research Development (BARD)  | 1999, 2002, 2008, 2009 |
| Ohio Agricultural Research and Development Center | 1998, 2005 |
| Belgium Research in Controlled Environment Agriculture | 1994, 1999, 2001, 2003, 2008, 2010 |
| U.S. EPA SBIR Panelist | 2006, 2007 |
| U.S. Department of Energy | 2008 |

*Review research proposals for continued:*

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| USDA NRI Agricultural Air Quality Panelist | 2005, 2007 |
| USDA SBIR Plant Production and Protection (Engineering): Topic Manager  Panelist  | 2000 1999 |
| USDA NRI Agricultural Systems: Panel Manager and Panelist | 1996. 1997, 1998 |
| Review personnel dossiers for promotion and tenure, typically 3-6/yr  | 2000-present |
| Review USDA/ARS manuscripts for Beltsville, MD; Clay Center, NE; and Starkville, MS staff scientists (2-4 annually) | 2000-present |

**Other Professional Service**

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| --- | --- |
| Kentucky Rural Energy Consortium Co-founder, Research Programs Coordinator | 2001-2008 |
| United Egg Producers Environmental Scientific Panel, Research Subcommittee ChairAmerican Egg Board Project on “Social Sustainability of US Egg Production,” Environment white paper task force. | 2003-20122008-present |
| External Examiner: University of Natal, South Africa 1999 Craig Leat M.Sc. 1996 Tony Amankrah M.Sc. Federal University of Viçosa, Brazil 2008 Marcelo Brauer D.S. 2002 Tadayuki Yanagi, Jr. D.S. Catholic University of Leuven, Belgium2010 Sezin Eren Öscan Ph.D. expected 2005 Cindy Boonen Ph.D.University College Dublin, Ireland 2010 Conor Dowling Ph.D. expected  | 2008, 2005, 2002, 1999, 1996 |
| Instructor: Statistics and Modeling Concepts for EMMS Data. Professional Development Workshop, sponsored by ASAE Technical Committee SE-301 Environmental Physiology. Presented at the Annual International Meeting of the ASAE, July 2000. Milwaukee, WI | 2000, July |
| Proctor of Fundamentals of Engineering Exam, Lexington, KY  | 1999 |

## University Service – University of Illinois at Urbana-Champaign

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| Director for two undergraduate semester study abroad programs: Bioenergy and Biological Systems Engineering: An Educational Consortium for a Sustainable Agriculture *(US-Brazil Partnership, with Purdue University, Universidade de São Paulo and Universidade Federal de Viçosa)*Transatlantic Biosystems Engineering Curriculum and Mobility (TABE.NET). (US-Europe Partnership, with Virginia Tech, University College Dublin, Madrid Polytechnic University, Agriculture University of Athens, and University of Bari, Italy) | 2008-2009 |
| Department of Agricultural and Biological Engineering:  |  |
|  Advisory Committee | 2009-2011 |
|  Course and Curriculum Committee | 2008-2012 |
|  Graduate Committee | 2009-2012 |

*University Service – University of Illinois at Urbana-Champaign --Continued*

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| College of Agricultural, Consumer and Environmental Sciences |  |
|  Dixon Springs Ag Center (DSAC) Faculty Advisory Council | 2008-2010 |
|  Graduate Educational Policy | 2009-2010 |
|  Paul A. Funk Recognition Award Committee  | 2008-2010 |
|  Promotion and Tenure Committee | 2008-2010 |
|  Research Academy Advisory Council | 2009-2010 |
|  Spitze Land-Grant Professional Career Excellence Award Committee | 2008-2010 |
|  Representative to S-105 System Controlling for Pollutant Emission and Indoor Air Quality for Livestock | 2009-2010  |
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| College of Engineering |  |
|  Executive Committee (Substitute) | 2009-2012 |

## University Service – University of Kentucky

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| Search Committee, Office of International Affairs, Assistant Director of Study Abroad  | Fall 2005 |
| Promotion and Tenure Area Committee, Science and Engineering | 2001-2003 |
| Director of Graduate Studies, Department of Biosystems and Agricultural Engineering | 2001-2003 |
| Dean’s Faculty Advisory Council, College of Engineering | 1998-2000 |
| Research Committee, Chair, Department of Biosystems and Agricultural Engineering | 2001-2002 |
| Computer Committee, Department of Biosystems and Agricultural Engineering | 1988-1995, 2000-2002 |
| Graduate Committee, Department of Biosystems and Agricultural Engineering | 1995-2001 |

INVENTIONS

Features included on some of the inventions listed below illustrate the relevance and impact of research work on industry. Many features and innovations contained within these products have been widely adopted by the U.S. and European agricultural equipment industry. For example, technical features contained in the OpTimer (late 1980’s design) have been widely copied and are now standard features on commercially available controllers used for livestock, poultry and greenhouse environment control systems.

* Time Integrated Variable Controller (TIV), an environmental control unit that manipulates livestock environment based on a running average temperature. Patented (with M. B. Timmons, Cornell University). Marketed by Thevco, Montreal, Quebec. 2002-2008.
* Dual Zone (DZ) Greenhouse Stage Controller, heating and ventilation stage controller, with day/night setpoint automation, power relays and capability for independent control of two zones or houses. 1999-2004.
* Oxygen Monitor and Control for Contained Aquaculture. A microprocessor-based device (AquaStager) to actuate supplemental oxygenation equipment. Marketed by Aquatic Eco-Systems, Inc. 1994-1999.
* Shinwa Environmental Controller (SEC), a microprocessor-based environmental control unit for staged ventilation of broiler and swine buildings. Utilizes a programmable staging feature to facilitate installation in different structures. Transition between interval timed-based minimum ventilation to stage 1 of temperature-control ventilation is performed proportional control of the on-time. This feature has become standard for most new control systems. Marketed by Aerotech, Inc. as the AeroStager 1989-1997.
* Profit Producer, a microprocessor-based environmental control system that implements economic optimization strategies in broiler housing. 1986-1989.
* OpTimer, a ten minute cycle timer driven by a commercially available environmental controller, translates an analog signal to a timer function for minimum ventilation in livestock housing. This control logic, similar to that used in the SEC, has been widely adopted by industry. 1989.
* VariTimer, an independent ten minute cycle timer with temperature sensing. Consultant to Optim Ag Ltd. and Research Concepts Inc. for prototype development. 1989.
* Side Kick, a device that translates a pulse width modulated signal into ten discrete fan stages, for U.S.A. livestock environmental control systems. This concept was immediately picked up and promoted by Opticon and Fancom in the Netherlands, and can now be found on all domestic-manufactured systems as well, including those from Chore-Time, Acme Engineering, Thevco, etc. 1989.

RESEARCH ACTIVITIES – Current Hatch and USDA Regional Projects

NE-1035 Multi-State Project – Commercial Greenhouse Production. 2008-present.

Previously PI for S1025, W173, W1173, NE-1022, NE-1035 at University of Kentucky

Chair, S1025 2011-2012

Extramural Funding

*Pending*

1. Development of a novel two-step, automated euthanasia systems for humane euthanasia of piglets using nitrous oxide. USDA NIFA AFRI. D.C. Lay Jr., R.S. Gates, J.-L. Rault. $499,216.
2. Assessing wean-to-finish swine sorting methods for the purpose of optimizing production performance and animal well-being using a wireless feeding behavior-monitoring system. USDA NIFA AFRI. T. Brown-Brandl, L.M. Pepple. M. Hayes, G. Roher, R.S. Gates, J.N. Marchant-Forde. $500,000.

*Current and Recent*

1. *Ambiência Animal em Condições de Climas Quentes – Ferramentas e Sistemas Inteligentes de Avaliação do Cenário Termico, Aéreo e Comportamental e Suas Relações no Espaço e no Tempo Para a Avicultura de Postura*. (Animal Environments in Hot Climates: Tools and Intelligent Systems for Evaluating the Thermal Environment and its Relation to Space and Time in Laying Hen Facilities.) *Ciências Sem Fronteiras* (Science Without Borders). *Programa de Pesquisador Visitante Especial.* (Special Visiting Researcher program). *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq). 2013-2016. R$92,000. Supports monthly stipend, travel, Brazilian graduate students and up to three months per year in Brazil for three years.
2. Certified Livestock Manager Training Program – FY 2014. Illinois Department of Agriculture. R.S. Gates and L. Pepple. 2013-2014. $75,000
3. Thermal Perches as Cooling Devices for Reducing Heat Stress in Caged Laying Hens. USDA NIFA AFRI. H.W. Cheng, P.Y. Hester, R.S. Gates, M.M. Makagon, W. Wigle, N.J. Olynk Widmar. 2013-2016. $499,814.
4. *Modificações ambientais em aviários de postura em alta densidade de alojamento e seus efeitos sobre o desempenho produtivo das aves e a qualidade dos ovos. (*Modified Environment in High Density Laying Hen Facilities and its Effect on Productive Improvement and Egg Quality.) *FAPEMIG- Fundação de Amparo à Pesquisa do Estado de Minas Gerais.* (Research Agency of the state of Minas Gerais, Brazil). *Programa Bolsa Pesquisador Visitante Especial* (Special Visiting Researcher Program, State of Minas Gerais, Brazil). R$17,500. 2013.
5. Measurement, Documentation and Postharvest Processing for the Prevention of Postharvest Losses of Soybeans and Corn in Brazil. ADM Institute for Post-Harvest Loss. M.G. Danao, R.S. Gates, M.R. Paulsen, K.D. Rausch. 2012-2015. $585,000.
6. Decision Support for Environmental Management of Cage and Cage-Alternative Layer Housing Systems for Thermal Comfort and Air Quality. USDA AFRI. A.R. Green, R.S. Gates, Y. J. Johnson-Walker, H. Cheng. 2012-2017. $699,896.
7. Microbial Ecology Evaluation of Foam Production in Swine Deep-Pit Manure Storages. Iowa Pork Producers, subcontract with Iowa State University. R.S. Gates, L. Pepple, A. Kent. 2012 – 2013: $156,713. 2013-2014: $114,762.
8. Bioenergy and Biological Systems Engineering: An Educational Consortium for a Sustainable Agriculture. R.S. Gates, A.R. Green, L.R. Rodriguez, K.C. Ting, Y. Zhang (UIUC), and B. Engel, R. Mohtar and O. Campanella (Purdue University), U.S. Department of Education Fund for the Improvement of Post-Secondary Education U.S.-Brazil Program. PI. University of Illinois at Urbana-Champaign, Purdue University, University of São Paulo-Pirassununga, and Federal University of Viçosa. $250,000.
9. Transatlantic Biosystems Engineering Curriculum and Mobility (TABE.NET). U.S. Department of Education Fund for the Improvement of Post-Secondary Education Atlantis Program. M.L. Wolfe and S. Mostaghami (Virginia Polytechnic Institution) and R.S. Gates (UIUC). September 1, 2009. Project duration: 4 years. 2009-2013. $192,000.
10. Microbial Community Analysis to Identify Risk Factors in Manure Foaming. National Pork Board. R.S. Gates, T. Funk, A. Kent and L. Pepple 2011-2012. $29,983.
11. Mitigation Monitoring and Microbial Assessment of Gas-Phase Biofilters and Extension Outreach. U.S. Department of Agriculture, Air Quality Program. K.A. Janni, J. Schilling, L.D. Jacobson, J. Harmon, S. Hoff, R. Nicolai, and R.S. Gates. February 1, 2010 Project Duration: 3 years. 2010-2013. $597,806. ($6,812 subcontract.)
12. Integrating education and development of a biodegradable litter amendment to mitigate ammonia emissions from poultry houses. USDA NRI Air Quality program. Co-PI with J. Arogo, Virginia Polytechnic Institution. 2009-2013. $77,128 subcontract to UIUC.
13. Mitigation Monitoring and Microbial Assessment of Gas-Phase Biofilters and Extension Outreach. USDA NRI Air Quality program. K.A. Janni, J. Schilling, L.D. Jacobson, J. Harmon, S. Hoff, R. Nicolai, R.S. Gates. 2010-2013. $597,806.

*Recent Submissions*

1. Chile-USA Study Abroad Program with Service-Learning: Lean Manufacturing. Partners of the Americas Foundation, DOS and NAFSA. $70,000. R.S. Gates, T. Finis, M. Blumthal and B. Litchfield
2. Development of a novel two-step, automated euthanasia systems for humane euthanasia of piglets using nitrous oxide. USDA NIFA AFRI. D.C. Lay Jr., R.S. Gates, J.-L. Rault, C. Johnson. $499,216.
3. Environmental Probiotics: Manipulating Microbial Ecology of Poultry Housing to Reduce Egg-borne Pathogens. A. Kent, A.R. Green and R.S. Gates. National Science Foundation, Ecology of Infectious Diseases Program. $1,891,081. 2013 – 2017. Not funded.
4. Modernizing Agricultural Education and Training Systems Program. US Agency for International Development. R.S. Gates and J.E. Pettigrew. 2012-2017. $6,250,004. Not funded.
5. Integrated Approaches to Climate Change and Variability for the Midwest Pork Industry. USDA AFRI Global Climate Change. D. Meisenger, et al. 5 years. 2012 – 2017. $10,000,000. Not funded.
6. A USA-China-Brazil Consortium for Environment-Enhancing Energy Research and Education. NSF PIRE Program. Y. Zhang et al. 3 years 2012-2015. $5,000,000. Not funded.
7. Microbial Community Analysis to Identify Risk Factors in Manure Foaming. National Pork Board. R.S. Gates, A. Kent, T. Funk and L. Pepple. 2012-2013. $30,000. Not funded.
8. Vertical Vegetable Farming R&D for Total Resilience in Leafy Vegetable Supply for Singapore. Collaborator. Proposal for NRF-funding for Meeting Future Food Demands for Singapore, submitted by AFV of Singapore, Singapore University of Technology and Design, Advanced Digital Sciences Center, University of Illinois and SkyGreens PL. Approximately $10,000,000. Not funded.
9. Improving Safety of Deep-Pitted Swine Barns. NIOSH Ag Center, University of Nebraska – Lincoln (subcontract to University of Minnesota). R.S. Gates, M.Robert, A.Kent, R. Aherin, T.Funk. 2011-2016. $219,164. Not funded.
10. Specialty Crops Enterprises for Enhanced Local Self-Reliance and Resiliance. X. Wang and R.S. Gates. USDA SCRI. Subcontract to Ohio State. 2011-2016. $1,000,933. Not funded.
11. Environmental Probiotics: Manipulating Microbial Ecology of Poultry Housing to Reduce Egg-borne Pathogens. A. Kent, A.R. Green and R.S. Gates. National Science Foundation, Ecology of Infectious Diseases Program. $1,891,081. 2011 – 2014. Not funded.
12. USPCE Integrated, Sustainable Approaches to Climate Change for the Midwestern Pork Industry. USDA AFRI Global Climate Change Program. $20,000,000. D. Meisenger, R.S. Gates, L.D. Jacobson, E. Cortus and J. Koziel. (University of Illinois subcontract, $4.6M) 2011-2015. Not funded.
13. Environmental Management Risk Factors for E. coli Peritonitis in Layer Hens: A Basis for Prevention and Control. USDA AFRI, Foundational Programs, Animal Health. A.R. Green, A. Kent, Kohrt, Gates. $499,925. 2011-2016. Not funded.
14. Developing Scholars in Agricultural Systems Engineering for a Bio-Based Economy. USDA National Needs Program. 2011-2015. Co-PI with M.G. Danao, S.R. Eckhoff, R.S. Gates and Y. Zhang. $236,000. Not funded
15. Decision Support for Environmental Management of Cage and Cage-Alternative Layer Housing Systems for Thermal Comfort and Air Quality. USDA AFRI Animal Welfare Program. A.R. Green, R.S. Gates and Y. Johnson. $699,899. Not funded
16. Establishing vibrant specialty crops enterprises for building self-reliant and resilient cities. R.S. Gates, X. Wang, T. Funk and D. Warnock. USDA Specialty Crops Research Initiative. Subcontract to Ohio State University. $1,499,967. Not funded.
17. Developing Scholars in Agricultural Systems Engineering for a Bio-Based Economy. USDA National Needs Program. 2010-2014. Co-PI with M.G. Danao, S.R. Eckhoff, R.S. Gates and Y. Zhang. $236,000. Not funded
18. Sustainable and Competitive Controlled Environment Plant Production Systems (CEPPS). USDA Specialty Crops Research Initiative Planning Grant. Co-PI with D. Warnock (NRES), B. Branham (NRES) and K.C. Ting (ABE). 2009-2010. $50,000. Not funded
19. Quantifying and Reducing Uncertainty in Ventilation Rate Measurements to Improve Emission Estimation from AFOs. USDA Agriculture and Food Research Initiative. Co-PI with K.D. Casey (Texas A&M) and Y. Liang (University of Arkansas). 2009-2012. $600,000 ($222,992 subcontract to UIUC). Not funded
20. Dairy Producer Management Strategies for Composted Bedded Pack in Loose Housing that Minimize GHG Emissions and Maintain Herd Productivity. USDA Agriculture and Food Research Initiative. Co-PI with J.L. Taraba, G.B. Day, V., M. Coyne, J.M. Bewley, and D.G. Overhults (University of Kentucky). $599,985. ($102,520 subcontract to UIUC.) Not funded

*Recently Completed Activities*

1. Characterization of PM2.5 and PM10 particulate emissions and the relationship to activity in typical poultry houses. $532,346, 2008-2010, W.F. Ritter, E.R. Benson, M.V. Johnston, G.L. VanWicklen, and R.S. Gates).
2. 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. United Egg Producers, Inc. ($1,847,248 request; $25,908 subcontract to UI). 2008-2010. USDA NRCS Conservation Innovation Grants program.
3. 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. United Egg Producers, Inc. ($1,847,248; $24,972 subcontract to UK). 2007-2008. USDA NRCS Conservation Innovation Grants program.
4. Gaseous production from impermeable swine waste storage tanks and its abatement using biofilters. USDA National Research Initiative Air Quality Program. 2008-20010. $41,572 subcontract to UIUC.
5. Poultry House Evaluation Service. Kentucky Poultry Federation ($825,716 request to Kentucky

Agricultural Development Board, $395,566 subcontract to UK). 2007-2010. D.G. Overhults, R.S. Gates and A.J. Pescatore.

1. Development of Line-Scan Image Algorithms for Inspection of Poultry Carcasses. USDA ARS Specific Cooperative Agreement. $10,000. 2007-2008.
2. Fan Assessment Numeration Systems (FANS) for Agricultural Building Ventilation Measurement in Emissions Testing. Contract with Purdue University. 2007. R.S. Gates, P.I. $60,000
3. Gaseous production from impermeable swine waste storage tanks and its abatement using biofilters. USDA National Research Initiative Air Quality Program. R.S. Gates, A. Singh, S.F. Higgins and E.G. Wilkerson. $487,087, 2007-2009.
4. Biosystems and Agricultural Engineering – Educational Consortium for Sustainable Plant and Animal Production Systems. $204,000. Project leader. With Iowa State University, and four Brazilian Universities (Viçosa, Lavras, Campina Grande, Piricicaba). U.S. Department of Education’s Fund for the Improvement of Postsecondary Education (FIPSE), 2003-2008.
5. Energy Seed Grant Technical Merit Review. Governor’s Office of Energy Policy, Division of Renewable Energy and Energy Efficiency. R.S. Gates. $27,963, 2006-2008.
6. Ammonia Gas Sensors for Agricultural Applications. Synkera Technologies Inc. R.S. Gates. $15,535. 2006-2007.
7. Field Verification of Ammonia Emission Mitigation Strategies for Layer Houses. H. Xin, R. Burns, R.S. Gates, P. Patterson and E.F. Wheeler. US Poultry & Egg. $75,285 to Iowa State University.
8. Kentucky Rural Energy Supply Program, C. Metcalf (University of Louisville, $1,984,000 U.S. Department of Energy). R.S. Gates, S.E. Nokes, D.G. Colliver and M.D. Montross $268,600 (subcontract awarded by University of Louisville for competitive grants administration). 2005-2007.
9. Total Suspended Particulate, PM10, PM2.5, Hydrogen Sulfide and Hydrocarbon National Consent Agreement Emissions Determination from Broiler Production Systems. R.T. Burns, H. Xin, R. Gates and S. Hoff. $648,231 awarded by Tyson Foods. 2005 -2007. (UK subcontract $60,000).
10. Ammonia Emissions Determination from Broiler Production Systems. R.T. Burns, H. Xin and R.S. Gates. $399,525 awarded by Tyson Foods. 2005-2007. (UK subcontract $92,121).
11. Effect of enzyme inhibitors on ammonia emission from broiler houses. $18,000. R.S. Gates, A. Singh, K. Casey and A. Pescatore. North Carolina Animal and Poultry Waste Management Center. 2004-2006
12. Energy-Star Energy Efficient State Fair Exhibit. $22,700. R.E. Fehr, G. Hash and R.S. Gates. KY Natural Resources and Environmental Protection Cabinet, Division of Energy. 2004-2005.
13. A Cooperative Extension Program for Kentucky’s Building Systems Energy Needs. $63,066. R.E. Fehr and R.S. Gates. KY Natural Resources and Environmental Protection Cabinet, Division of Energy. 2004-2005.
14. Reduced Ammonia Emissions from Poultry Houses by Enhanced Manure and Diet Management. $870,000. USDA IFAFS. 2001-2005. Project leader. Participants include University of Kentucky, Iowa State, Penn State, University of Nebraska, USDA-ARS Southern Poultry Lab, US-EPA, and a private nutritionist.
15. Development of Robust, Automatic Calibration Algorithms for On-line Detection of Diseased and defective Poultry Carcasses. $358,043. PI. 2002-2007. USDA-ARS, Instrumentation and Sensing Laboratory, Beltsville, MD.
16. Developing a Low-Cost, Portable Vision Device for Inspecting Agricultural Products for Safety. $356,570. PI. USDA-ARS. 2002-2006. Instrumentation and Sensing Laboratory, Beltsville, MD.
17. Energy-Star Energy Efficient State Fair Exhibit. $20,000. PI. KY Division of Energy. 2003-2004.
18. A Cooperative Extension Program for Kentucky’s Building Systems Energy Needs. $59,882. PI. KY Division of Energy. 2003-2004.
19. Estudo de Sistema de Resfriamento Adiabático Evaporativo, con uso de Materias Alternativos a seu Emprego em Instalaciaos Climatizados para Producão Animal, nas Condicões Brasilieros. (Study of alternative evaporative cooling materials for animal production in Brazilian conditions) FAPEMIG – Fundacao de Amparo a Pesquisa do Estado de Minas Gerais, Brasil (Research Funding Agency of State of Minas Gerais). Ref. CAG 679/2002. R$21,000 2002-2004. This funded Ricardo Vigoderis’ M.S. project. Co-PI. (PI: Prof Ilda Tinôco).
20. Sistema de Mensuraé de Amônia em Ambiente Abertos e Aplicaión para Diferentes Manejos de Criação de Frango de Corte e Suinos nas diferentes estacos elimaticar no Sul e Sudeste do Brasil – Avaliacias da Qualidade do Ar, Producieo de Calor, Comforto Térmico e Desemprenho (Amonia measurement system for open buildings with application to broilers and swine facilities in Southern and Southeastern Brazil – Evaluation of Air Quality, Heat Production and Thermal Comfort). CNPq – Concelho Nacional de Pesquisa (Technology and Science Minstery, Brazilian Federal Agency). Support for 6 graduate students, 6 undergraduate students and 1 researcher. 2003-2006. Co-PI. (PI: Prof Ilda Tinôco).
21. Avaliaciao do Sistema da Cama Sobreporta na Producao de wuinos nos faser de Crescimento e Terminaciao em Condicoes de Invierno no Sul do Brasil (Evaluation of a deep-bed litter system in swine nursery and finishing facilities during winter in southern Brazil). CAPES – Fundaciao do Apoio ao Peroal de Enono Superior, Minesterio da Ciência e Tecnología (Technology and Science Minstery, Brazilian Federal Agency), and EMBRAPA (Brazilian Research on Agro-business, Concordia) with Federal University of Viçosa. R$30,000 for one M.S. student project. 2001-2003. Co-PI. (PI: Prof Ilda Tinôco).
22. Quantification of Feeding and Drinking Behavior of Poultry for Enhanced Animal Well-Being. $150,709. USDA NRI. 2000-2001. PI.
23. Amino Acid Nutrition in Broiler Diets. $15,000 gift. Ajinomoto Heartland Inc. Co-PI with H. Xin, Iowa State University. 2001.
24. Amino Acid Nutrition in Layer Diets. $10,000 gift. Ajinomoto Heartland Inc. University of Kentucky. 2001. PI.
25. Optimizing Partial Surface Wetting to Cool Caged Layers. U.S. Poultry and Egg Association. $52,279. Co-PI with H. Xin, Iowa State University and M. Beck, University of Nebraska. 2001-2002.
26. Cooling Cage Laying Hens by Partial Surface Wetting, U.S. Poultry and Egg Association. $24,000. 2000-01. Co-PI with H. Xin, Iowa State University. 2000-2001.
27. Towards a dynamic system for controlling mist propagation of softwood cuttings. Gloeckner Foundation. $10,000 (2000-2001), $9,000 (1999-2000). Co-PI with R. Geneve, Horticulture Department.
28. Evaluating Improved Environmental Systems for Tobacco Greenhouses. $9,475. With G.A. Duncan. Council for Burley Tobacco. 1998-2000.
29. Equipment grants for automated greenhouse environment control. $7,529. Co-PI with G.A. Duncan. 1999-2000.
30. Ammonia Emissions from Poultry Litter. Heartland Lysine, Inc. PI. $28,200 gift. 1999-2000.
31. Development of an instrumentation system to measure individual chicken feeding and drinking behavior as influenced by environment and nutrition interactions. $54,000. 1998-2000. With Drs. H. Xin and M. Puma, Iowa State University and Heartland Lysine, Inc.

TEACHING AND STUDENT ACTIVITES – University of ILLINOIS

## Courses Taught

ABE 100 Introduction to Agricultural and Biological Engineering Fall 2009-2013

TSM 199 Basics of AutoCAD Every semester since Fall 2011

TSM 311 Humanity and the Food Web Fall 2009, Spring 2010

TSM 371 Residential Housing Design Spring 2009-2012

TEACHING AND STUDENT ACTIVITES – University of Kentucky

## Courses Taught

AEN 103 Surveying (for Landscape Architects) Fall 2005

AEN 202 Biosystems Engineering Problems (Biometrics) Annually, 1990-1999

BAE 202 Statistical Methods for Biosystems Engineering Spring, 2008

GEN 300 Co-taught. (This course was an introduction to French culture and agriculture and required as part of cooperative two-week visit or six-week internship with

 the ENESAD program in Dijon, France.) Spring 1996, 1997

 Traveled with 14 University of Kentucky, 9 University of Nebraska and

 1 Clemson student 1996

AEN 302 Analytical and Numerical Methods in Biosystems Annually, 1988-1997

ASC 340 Poultry Production Systems: guest lecturer on environment control 1994-2000

BAE 450 Fundamentals of Electricity for Agriculture (special problem) 2005

AEN 427G Structures 1991, 1992

BAE 427 Structures and Environment Design 2002-2008

AEN 599 PC-Based Data Acquisition and Control 1994-1999, co-taught 2001

PLS 605 Graduate Research in Horticulture: guest lecturer on VPD control 1998, 1999

AEN/ME 647 Systems Optimization I 1999, 2002, 2003

AEN 658 Instrumentation for Research 1992, co-taught 2002

AEN 750 Special Problems, as required for graduate students approximately each 3 semesters

## Advising

Faculty freshman advisor for the Department of Agricultural and Biological Engineering and Undergraduate advisor for the Bioenvironmental Engineering Section, Department of Agricultural and Biological Engineering, University of Illinois.

Faculty advisor for the Controlled Environment Systems Engineering Program in the Department of Biosystems and Agricultural Engineering, University of Kentucky. Encouraged student participation in local ASHRAE Chapter. Provided job placement and summer training of students.

## Graduate Students Advised

***University of Illinois at Urbana-Champaign***

|  |  |  |
| --- | --- | --- |
| **Name** | **Degree** | **Year** |
| Pepple, Laura M. | Ph.D. | In progress, August 2013-present |
| Jonathon Olsen | Ph.D. | January-December 2013, Advisor |
| Peng Li | Ph.D. | In progress, co-advisor |
| Akaterini Kasimati | M.S. | In progress, advisor |
| Boyu Ji | M.S. | In progress, advisor |
| Kaneeka Sood | M.S. | In progress, co-advisor |
| Brett Ramirez | M.S. | In progress, committee member |
| Wilhelmi, Christopher | M.S. | In progress, committee member |
| Yijie Xiong | M.S. | Completed December 2013, co-advisor |
| Yi Sun | M.S. | Completed December 2013, co-advisor |
| Ryan Johnson | M.S.  | Completed August 2013, committee member |
| Liangcheng Yang | Ph.D. | Completed May 2013, committee member |
| G. Tatiana Sales | Ph.D. | Completed August 2012, co-advisor |
| D. Barker | Ph.D. | Completed 2012, committee member |
| Shi-Fang Chen | Ph.D. | Completed 2012, committee member |
| W. (David) Liu | Ph.D. | Withdrew from school  |
| W. Yan | Ph.D. | Completed 2010, committee member |
| X. Yang | Ph.D. | Completed 2010, committee member |
| J. McClure | Ph.D. | Completed 2010, committee member |
| C. Cirone | M.S. | Completed 2010, committee member |

***University of Kentucky***

|  |  |  |
| --- | --- | --- |
| **Name** | **Degree** | **Year** |
| Flavio Damasceno | Ph.D. | Completed 2012, committee member |
| Lucas de Melo | M.S. | Completed 2012, committee member |
| Gabriella Morello | M.S. | Completed 2011, committee member |
| Igor Lopez | M.S. | Completed 2011, committee member |
| Guilherme del Nero Maia | Ph.D. | Completed 2010, committee member |
| Jamie Marsh |  M.S. | 2008 |
| G. Tatiana Sales |  M.S. | 2008 |
| Peng Li |  M.S. | 2008 (co-advisor) |
| Guilherme Maia |  Ph.D. | In progress, 2009 completion expected |
| Kenneth Casey |  Ph.D. | 2005 |
| Joseph Purswell |  Ph.D. | 2004 |
| G. Avery Watkins |  M.S. | 2004 |
| Virginia-Bibb Golden |  M.S. | 2004 |
| Jeremiah Davis |  M.S. | 2004 (co-advisor) |
| Angela Green |  M.S. | 2004 |
| Erin Wilkerson |  M.S. | 2002 |
| Sérgio Zolnier |  Ph.D. | 1999 |
| Kevin Chao, Ph.D.  |  Ph.D. | 1996 |
| Christian Mach |  M.S. | 2000 |
| Nan Tao |  M.S. | 1999 |
| Hsien-Chung Chi |  M.S. | 1993 |
| Shu Hui Zhang |  M.S. | 1992 |
| Jeff Tolzin |  M.S. | 1988 |

***n progressistallama Vieira8-2013)r. 1 .n. d Biological Engineering studentsSymposium Iglets using nitrous oxide in BrazilFederal University of Viçosa, MG Brazil***

|  |  |  |
| --- | --- | --- |
| **Name** | **Degree** | **Year** |
| Carlos G. Teles Junior | D.S. | In progress, advisor |
| Maria F.V. Araujo | D.S. | In progress, advisor |
| Múcio Mendes | D.S. | In progress, advisor |
| Maurílio Duarte Batista | M.S. | Completed, 2014 (advisor) |
| Múcio Mendes | M.S. | Completed, 2012 (co-advisor) |
| Michelle dos Santos |  M.S. | Completed, 2012 (committee member) |
| Jairo Alexander Osorio Saraz |  D.S. | Completed, December 2010 (co-advisor) |
| Olga Marin | M.S. | Completed, December 2010 (co-advisor) |
| Marcos Oliveira de Paula |  D.S. | Completed, December 2009 (committee member) |
| Maira Freire do Amaral |  M.S. | 2007 (co-advisor) |
| Claudio Elíar do Silva |  M.S. | 2002 (co-advisor) |
| Ricardo Brauer Vigoderis |  M.S. | 2002 (co-advisor) |
| Marcelo Bastos Cordeíro |  M.S. | 2003 (co-advisor) |
| Robson de Paulo |  M.S. | 2003 (co-advisor) |
| Mariano Silva |  M.S. | 2003 (co-advisor) |
| Tadayuki Yanagi  |  D.S. | 2002 (at Iowa State University, co-advisor, Federal University of Viçosa, Brazil). |
| Claudio Elíar do Silva  |  D.S. | In progress, Federal University of Viçosa, Brazil |
| Marcelo Bastos Cordeíro  |  D.S. | In progress, Federal University of Viçosa, Brazil |
| Mariano Silva  |  D.S. | In progress, Federal University of Viçosa, Brazil |
| Ellie Derbyshire | 2007 |
| J. Swamy | 2007 |
| Ricardo Brauer Vigoderis |  D.S. | 2006, Federal University of Viçosa, Brazil |
| George Day | 2005 |
| Carmen Agouridis | 2004 |
| Keng Chuah | 2004 |
| Mari Chinn | 2003 |
| Czar Crofchek | 2001 |
| Sefa Tarhan | 2001 |
| Neil Paton (Animal Science) | 2001 |
| Tami Brown-Brandl | 1997 |
| W. Peter Sun | 1998 |
| Thomas F. Burks | 1997 |
| Ron E. Lacey | 1992 |
| John Chastain | 1991 |
| James Usry | 1989 |

*M.S. Committee member for the following students in various Departments at the University of Kentucky*

|  |  |  |
| --- | --- | --- |
| **Department** | **Name** | **Year** |
| Biosystems and Agricultural Engineering | Morgan HayesMari ChinnElizabeth BullockRonnie PaulJane PattersonSefa TarhanKaren LochteWen Ping QiuW. Peter SunT.F. BurksG. Scott OsbornJohn P. Chastain | 200820001999199919991996199519921992198919881987 |
| Entomology | David Held | 1999 |
| Veterinary Sciences | Cédric Holtz | 2000 |

*External Examiner*

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Degree** | **Year** | **University** |
| Conor Dowling | Ph.D. | 2012 | University College Dublin, Ireland |
| Sezin Eren Öscan | Ph.D. | 2011 | M-3 Bio-Res, Katholic University of Leuven, Belgium |
| Cindy Boonen | Ph.D. | 2005 | Agricultural Engineering, Katholic University of Leuven, Belgium |
| Craig M. Leat | M.Sc. | 1999 | Agricultural Engineering, University of Natal, South Africa |
| Tony Amankra | M.Sc. | 1996 | Agricultural Engineering, University of Natal, South Africa |

**Other Student, Post-Doctoral and Advising Activities**

*Host*

|  |  |  |
| --- | --- | --- |
| **Name** | **Dates** | **University** |
| Tania Baptista dos Santos | 2013-2014 | Professor, 1-yr sabbatical, State University of Mato Grosso do Sul, Aquadiana, Brazil |
| Mohammadamin Kashiha | 2013 | Doctoral Student, Catholic University of Leuven, Belgium |
| Danilo Pereira | 2012-2013 | Professor, 1-yr sabbatical, State University of São Paulo at Tupá, Brazil |
| Ana Paula de Assis Maia | 2010-2011 | Doctoral Student, 6 month sandwich program, State University of Campinas (UNICAMP), Campinas, São Paulo, Brazil. |
| Giselle Borges | 2010-2011 | Doctoral Student, 1-year sandwich program, University of São Paulo – Piracicaba (ESALQ) |
| Karla Lima | 2009-2010 | Doctoral Student, 1-year sandwich program, State University of Campinas (UNICAMP), Campinas, São Paulo, Brazil. |
| Professor Wallace Nascimento | 2004-2005 | Sabbatical leave from Federal University of Campina Grande |
| Professor Ilda F.F. Tinôco | 2002-2003 | Sabbatical leave from Federal University of Vicosa, MG Brazil |
| Professor Adelson A. Tinôco | 2002-2003 | Sabbatical leave from Federal University of Vicosa, MG Brazil |
| Professor N.S. Ferguson | 1997-1998 | Sabbatical leave from University of Natal, South Africa |
| P. Huang | 1994 | Post-doctoral study visit, Hunan Normal University, China |

Past Chair, Graduate Committee, Department of Biosystems and Agricultural Engineering, University of Kentucky: Review all applications for admission, graduate student research proposals and progress reports.

*Special Projects:* Support for Horticultural Science undergraduate theses projects.

*ASAE Student Branch****:*** Faculty Advisor 1996-1997; Hosted Southeast Student Rally in Lexington, KY 1998.

*Student Recruitment:* Meet with prospective students, attend shows, field days and open houses, and provide tours of campus facilities and departmental laboratories as needed.

EXTENSION AND OUTREACH ACTIVITES (partial list of recent activities)

## Greenhouse Engineering

In cooperation with Professor George Duncan, obtained support from the Burley Tobacco Council to improve humidity control in greenhouses used to germinate and grow tobacco transplants. These plants are raised in float trays, and moisture control requires proper adjustment of ventilation and heating systems to balance energy costs, plant hardiness, disease control, and ease of operation. 1999-2004.

* Example automated systems for mechanical and curtain-sided houses were developed and installed in four cooperators facilities (Lincoln, Davies, Shelby [2], and Montgomery counties in Kentucky), and monitored for two years to obtain data on performance, suitability of use, and assess humidity control. 2000-2004.
* Outcomes of the project to date include: an extension fact sheet, a draft video on greenhouse ventilation basics, web-based presentations on greenhouse control for Extension Agent training, development of quizzes for Cooperative Extension County Agent Training, and presentation of findings for both mechanically ventilated and curtain-sided automation.

## Livestock and Poultry Systems – Recent activities include:

* Certified Livestock Managers Training – an Extension training workshop for livestock and poultry producers in the state of Illinois. Annually, hosting 10-15 5-h workshops around the state.
* Poultry House Evaluation Service – develop programs for energy efficiency evaluation of broiler housing, specific to housing systems by integrator companies. Produce quarterly newsletters (Cheeps & Chirps). Generalize evaluation findings to each integrator (seven in Kentucky).
* Agricultural Air Quality. Addressing the need for science-based estimates, including evaluating various management strategies. Hosted stakeholder meetings at venues including: individual state poultry association meetings (Kentucky, Iowa, Pennsylvania, and Nebraska), Midwest Poultry Federation, Multi-State Poultry Nutrition Symposium, a CIGR-sponsored symposium in Europe in 2003 and EurAGENG in 2004, and Air and Waste Management Symposia in 2003, 2004 and 2005, Virginia Extension agent training 2008.
* Development of algorithms, wiring, installation and testing of TIV control in Kentucky and New York dairy facilities. Successfully convinced the world’s largest agricultural environmental controller manufacturer to incorporate the software technology onto their existing products (sales exceeded 50,000 units in 2000).
* Work with Kentucky broiler companies’ concerns for young, partially-feathered birds in tunnel ventilation experiencing wind chill. Provided estimate of effective temperature and guidelines for maximum tunnel velocity at different ages of birds. Annually since 1990.
* Troubleshoot and evaluate environment controls in pullet houses with excessive heating bills, condensation and poor indoor air mixing. Provide guidelines and education of fundamentals.
* Evaluate and provide guidelines for daily management of broiler facilities at high elevations in a dry climate, with poor inlet control and significant dust. Developed a simple method for manual inlet adjustment for workers, based on visual inspection of number of fans operating (Maputo, South Africa). 1993.
* Cooperate with colleagues (Drs. Tobin, Harkin) in Gluck Equine Center to develop two systems for Kentucky horse industry. The first is a motion system to assess the efficacy of different drug dose-response via horse activity, rather than blood samples. A second project involves early lameness detection (navicular disease) utilizing a force plate to obtain weight distribution. This latter system was constructed and tested for an M.S. project (C. Holtz). 1999.
* Environmental control in livestock and greenhouse facilities, with Brazilian colleagues, including a signed cooperative exchange agreement between the University of Kentucky and the Federal University of Vicosa (UFV) 2001. Projects with Brazilian agencies and companies including EMBRAPA, Coopervale, and UFV.

## Extension Publications and Presentations

1. Gates, R.S. and T. Funk. 2014. The Illinois Certified Livestock Manager (CLM) Training Program. Extension Bulletin, Department of Agricultural and Biological Engineering, University of Illinois at Urbana-Champaign. (English and Chinese).
2. Gates, R.S. and D. G. Overhults. 2008. How much attic insulation? Cheeps and Chirps 1(4):4-5. KY Poultry Federation, Lexington KY.
3. Gates, R.S. 2008. Greenhouse Gas Emissions (GHG) From Broiler Houses: A Non-Issue? Cheeps and Chirps 1(3):5. KY Poultry Federation, Lexington KY.
4. Gates, R.S. 2008. The Fan Assessment Numeration System (FANS). Cheeps and Chirps 1(3):3. KY Poultry Federation, Lexington KY.
5. Overhults, D.G. R.S. Gates and J. Jacobs. 2008. Poultry House Evaluation Service (PHES) Progress. Cheeps and Chirps 1(3):1,4-5. KY Poultry Federation, Lexington KY.
6. Gates, R.S. 2008. Update on Ammonia Emissions Reporting Requirements. Cheeps and Chirps 1(2):3. KY Poultry Federation, Lexington KY.
7. Duncan, G.A., R.S. Gates and M. Montross. 2005. Measuring relative humidity in agricultural environments. AEN-87. Cooperative Extension Service, University of Kentucky: Lexington, KY.
8. Gates, R. S. 2004. Technology for measuring emissions: Limitations/Benefits. In Proceedings 2004 National Poultry Waste Management Symposium, Memphis, TN. Editors J.B. Hess and K.D. Roberson. Pp. 107-119.
9. Gates, R.S., K. D. Casey, E. F. Wheeler, H. Xin, A.J. Pescatore, J. L. Zajaczkowski, J.R. Bicudo, P. A. Topper, Y. Liang, and M. Ford. 2004. Broiler house ammonia emissions: U.S. baseline data. Multi-State Poultry Feeding and Nutrition and Health and Management Conference and Degussa Corp. Technical Symposium: Indianapolis, IN.
10. Liang, Y., H. Xin, R.S. Gates, and E. F. Wheeler. 2003. Updates on ammonia emission from Iowa layer houses. Proceedings, Iowa Egg Industry Symposium: Ames, IA.
11. Gates, R.S., H. Xin and E.F. Wheeler. 2002. Ammonia losses, evaluations and solutions for poultry systems. Proc., 2002 National Poultry Waste Management Symposium. Editor, Patterson, P.H, J.P. Blake and K.D. Robertson. NPWM Committee. Pp. 79-88.
12. 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 Continuing Education Center. November 12. Ames, IA. Pp. 53-58.
13. Simposio de Ambiencia na Producão Animal, held during March 2002 at Federal University of Viçosa, Department of Agricultural Engineering. Reviewed graduate student projects, participated in Dr. Yanagi’s dissertation defense, lectured on environment control systems.
14. Gates, R.S. 2001. Dietary protein and ammonia production in broiler facilities. Invited Lecture. Midwest Poultry Federation: Nutrition Symposia: St. Paul, MN.
15. Gates, R.S. 2000. Manipulação da Dieta Avícola Considerando a redução na emissão de poluentes ao ambiente (Poultry diet manipulation to reduce output of pollutants to environment). Invited Lecture. Sponsored by EMBRAPA: Concordia: Brazil.
16. Gates, R.S., A.J. Pescatore, M.J. Ford, J.L. Taraba, K. Liberty, A.H. Cantor, and D.J. Burnham. 2000. The effect of feeding low protein diets on ammonia emission and total ammoniacal nitrogen in broiler litter. Proceedings, National Poultry Waste Management Symposium: Springdale AR. Pp. 169-180.
17. Gates, R.S. 2000. Introduction to psychrometric properties and processes. Tech/CPD seminar for Parameter Generation and Control (PGC), Inc.: Asheville, NC.
18. Gates, R.S., J.L. Taraba and K.R. Liberty. 1998a. Precision nutrition and litter volatilization dynamics. Proceedings, National Poultry Waste Management Symposium: Ocean City, MD. Pp. 378-386.
19. Gates, R.S. and G.A. Duncan. 1998. Ventilation system design parameters for greenhouses for tobacco production. AEU-90 Agricultural Engineering Update Series.
20. Poultry Housing and Equipment Handbook. Northeast Region Agricultural Engineering Series (NRAES). Editor and co-author: Chapter 5, Monitoring and Control Systems. Co-author: Chapter 4, Ventilation, Heating and Cooling. Co-author: Chapter 3, Poultry Production Systems.
21. Turner, L.W. and R.S. Gates. 1996. Modified environment systems for animals and plants. USDA Challenge Grant on Incorporating Biology in Senior Engineering Design. Video training tape, workbook. Tempe, AZ. July.
22. Turner, L.W., T.C. Bridges, J.L. Usry, and R.S. Gates. 1995. NCPIG Swine Growth Model Version 1.0 User’s Guide and Model Documentation. University of Kentucky College of Agriculture, Department of Biosystems and Agricultural Engineering Special Publication. March.
23. Gates, R.S. 1994. Regional variation in heat stress for broiler housing. Oral presentation to Kentucky Poultry Federation, October. Lake Barkley State Resort Park: Cadiz KY.
24. Gates, R.S. 1993. Economic optimization of broiler production. Oral presentation given on three separate occasions to: Iwate Poultry Farm, Kitasato University Faculty, and researchers in livestock environment.
25. Gates, R.S., L.W. Turner and D.G. Overhults. 1992. Performance of microprocessor controllers. EPRI TR-100175, Project 2782-4, Final Report. Electric Power Research Institute: Palo Alto, CA.
26. Gates, R.S. 1991. Considerations for environmental controllers in poultry facilities. Multi-state Newsletter, Poultry Extension and Research, Vol. 3(1). Cooperative Extension Series of the States of Illinois, Indiana, Kentucky, Michigan, and Ohio.
27. Gates, R.S., D.G. Overhults, L.W. Turner, and R.L. Fehr. 1991. Transient surge protection for agricultural facilities. AEN 70, AEU-58, University of Kentucky Cooperative Extension Service: Lexington, KY.
28. Gates, R.S. and D.G. Overhults. 1991. Electronic controls for broiler houses. AEN-71, AEU-56, University of Kentucky Cooperative Extension Service: Lexington, KY.
29. Overhults, D.G. and R.S. Gates. 1991. Electronic controls for swine buildings. AEU-57. University of Kentucky Cooperative Extension Service: Lexington, KY.
30. Gates, R.S. 1989. Recent trends in environmental control of poultry facilities. Multi-State Newsletter, Poultry Extension and Research, Vol. 1(5). Cooperative Extension Services of the States of Illinois, Indiana, Kentucky, Michigan, and Ohio.
31. Timmons, M.B. and R.S. Gates. 1988. Bird weighing as an integrated part of bird management. Poultry 4(4):27-29. Misset International.
32. Gates, R.S. 1987. Evaporative cooling for enhanced egg production. Presentation to the Kentucky Egg Council. October 1-2. Lake Cumberland State Resort Park: Jamestown KY.
33. Burks, T.F., L.W. Turner, W.L. Crist, J.L. Taraba, and R.S. Gates. 1988. Simulating cow throughput and labor efficiency in the dairy parlor. 1988. Dairy Research Report, University of Kentucky, College of Agriculture, Agricultural Experiment Station: Lexington, KY.

RESEARCH PUBLICATIONS

 Publications in Refereed Journals 139

 In Review 13

 In Preparation 14

 Book Chapters/Proceedings 7

 Abstracts, Papers and Presentations at Professional Meetings 260

 Others (Extension Newsletters, Popular Press, Speeches) >33

Book Chapters and Proceedings

1. Gates, R.S., H. Xin, B. Li and R. Zhano, editors. 2013. International Symposium on Animal Environment and Welfare. 19-22 October, 2013. Rongchang, Chongqing, China. 543 pp.
2. Purswell, J.L. and R.S. Gates. 2013. Chapter 8: Automation in Animal Housing and Production. Pp 205-230 In: Automation in Agriculture. Zhang, Q. and Pierce F.J. editors. Taylor & Francis Group, LLC. ISBN: 13: 978-1-4398-8057-9. 397 pp.
3. Cambra-Lopez, M. and R.S. Gates, editors. 2012. IX International Livestock Environment Symposium (ILES IX). Proceedings of the Ninth International Livestock Environment Symposium. 8-12 July.Valencia, Spain. St. Joseph, MI: ASABE.
4. Bridges, T.C. and R.S. Gates. 2009. Chapter 7: Modeling of Animal Bioenergetics for Environmental Management Applications. pp 151-179. In: DeShazer, J.A., ed. Livestock Energetics and Thermal Environmental Management, ASABE: St. Joseph, MI. 209 pp.
5. Moura, D. and R.S. Gates, editors. Livestock Environment VIII: Proceedings of the Eighth International Livestock Environment Symposium. 31 Aug – 4 September, Iguassu Falls, Brazil. St. Joseph, MI: ASABE.
6. Tinôco, I.F.F. and R.S. Gates. 2005. Ambiência e construções para matrizes pesadas. Chapter 2 in: Manejo de Matrizes de Corte. Fundação Apnco de Ciência e Tecnologia Avícolas, (FACTA) Publishers : Campinas, SP, Brazil. pp. 11-34 of 421.
7. Gates, R.S. 2001. Equipment for Poultry Production. Chapter 5.1.3.5 In: Encyclopedia of Life Support Systems, UNESCO/EOLSS Publishers Co. Ltd.: Oxford UK. Web version only.

REFEREED JOURNALS

1. Kashiha, M., A.R. Green. A.R., G.T. Sales or Lust, D. Berckmans, and R.S. Gates. 2014. Performance of an image analysis processing system for hen tracking in an environmental preference chamber. J Poultry Science. 93:1-10
2. Koelkebeck, K.W., S. dePersio, K. Lima, P.C. Harrison, C. Utterback, P. Utterback, R. Gates, A. Green and J.M. Campbell. 2014. Evaluation of feeding spray-dried bovine plasma protein on production performance of laying hens exposed to high ambient temperatures. J Applied Poultry Research. 23(3):393-402 doi:10.3382/japr.2013-00876
3. Zheng, W., Y. Zhao, H. Xin, R.S. Gates, B. Li., Y. Zhang and M. Soupir. 2014. Reduction of airborne dust and culturable bacteria by spraying slightly electrolyzed water in an experimental aviary laying-hen chamber. Transactions of the ASABE 57(1):229-236
4. Morello, G.M., D.G. Overhults, G.B. Day V., R.S. Gates, I.M. Lopes and J. Earnest Jr. 2014. Using the Fan Assessment Numeration System (FANS) in-situ: A procedure for minimizing errors during fan tests. Transactions of the ASABE 57(1): 199-209
5. Yang, L., A.D. Kent, X. Wang, T.L. Funk, R.S. Gates, and Y. Zhang. 2014. Moisture effects on gas-phase biofilter ammonia removal efficiency, nitrous oxide generation and microbial communities. *Journal of Hazardous Materials. Accepted for Publication*
6. Bridges, T.C., R.S. Gates, E.M. Smith and L.W. Turner. 2013. Modeling the growth of laboratory and farm animals: Part 2. Polytocus animals and the relationship of birth weight, gestation time, and mature size. Transactions of the ASABE 56(3):1133-1144 (doi: [dx.doi.org/10.1303/trans.56.10071](http://dx.doi.org/10.1303/trans.56.10071)) *\*Superior Paper Award, ASABE*
7. Zheng, W., Y. Zhao, H. Xin, R.S. Gates, Y. Zhang and M. Soupir. 2013. Concentrations and size distributions of airborne particulate matter and bacteria in an experimental aviary laying-hen chamber. Transactions of the ASABE 56(6):1493-1501. Doi <http://dx.doi.org/10.13031/trans.56.10141>
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**INVITED PRESENTATIONS AND LECTURES**

1. Gates, R.S., T. Funk and Y. Xiong. 2014. The Development of Nutrient Management Practices and Technologies in the U.S. 2014 U.S.-China Swine Industry Symposium: Livestock Nutrient Management-Issues, Policies, and Technology. November 12. Beijing, PRC.
2. Gates, R.S. 2014. Controladores – Experiência Americana (Controllers – North American Experience). Presentation at the Workshop on Controllers and Sensors in Barns, at the AveSui Convention and Trade Show, 15 May, Florianópolis-SC, Brazil.
3. Gates, R.S. on behalf of D.G. Overhults. 2014. Necessidade de Isolamento em Clima Quente (Necessity of Insulation in Hot Climates). Presentation at the Poultry Environment Panel, 14 May, Florianópolis-SC, Brazil.
4. Gates, R.S. 2013. Broilers Dark House Workshop – Metologias para Mensuração de Gases em Aviários Tipo Túnel (Methods for measuring gases in tunnel ventilated poultry housing). Lecture and paper presented at the 12th Poultry and Swine Technical-Scientific Seminar, 15 May. Florinaópolis SC, Brazil.
5. Gates, R.S. 2013. Broilers Dark House Workshop – American Experience. Lecture and paper presented at the 12th Poultry and Swine Technical-Scientific Seminar, 14 May. Florinaópolis SC, Brazil.
6. Gates, R.S. 2011. Agricultural and Biological Engineering at the University of Illinois. Faculty and students of the University of Sao Paulo – Pirassununga campus. 4 November.
7. Gates, R.S. 2011. Strategies for cooling in high-density laying hen housing systems. International Symposium on Health, Environment and Animal Welfare. Invited lecture 19-22 October. Chonqing, PRC
8. Gates, R.S. 2011. An engineering perspective on laying hen welfare, with consideration for pigs too. International Symposium on Health, Environment and Animal Welfare. Invited lecture given on behalf of Dr. A.R. Green. 19-22 October. Chonqing, PRC.
9. Gates, R.S. 2011. Agricultural and Biological Engineering at the University of Illinois. Faculty of the University of Florence. 1 June, Florence, Italy. Gates, R.S. 2011. Ag & Biological Engineering: New research trends in bioenvironmental engineering. Invited lecture to University of Florence doctoral students. 31 May, Florence, Italy.
10. Gates, R.S. 2011. Design of new farm buildings: trends in the USA. Invited lecture to University of Florence Agricultural Sciences students. 30 May, Florence, Italy.
11. Gates, R.S. 2009. Plant and animal environmental control for the 21st century. Bioproducts and Biosystems Engineering Department Centennial Lecture Series, February 12. University of Minnesota, St. Paul.
12. Management of odors in poultry: overview of U.S. Colombian Poultry Federation, Medellin, Colombia.
13. Gates, R.S. 2008. Emission Measurement Technologies. Invited lecture, National Poultry Waste Management Symposium. 21-23 October, Des Moines IA.
14. Gates, R.S. 2008. U.S. animal feeding operations air emissions mitigation: state of science. Keynote address. Conference on Mitigating Air Emissions from Animal Feeding Operations: Exploring the advantages, limitations, and economics of mitigation technologies. May 19-21. Des Moines, IA.
15. Gates, R.S. 2008. Broiler, turkey and layer building ammonia emissions overview. Presentation, U.S. Poultry and Egg Association Environmental Management Seminar. March 5-6. Atlanta, GA.
16. Gates, R.S. 2006. Recent advances in livestock and poultry production systems. Invited lecture, IV Biometeorology Brazilian Conference. April 11-14. Ribeirão Preto, SP, Brazil.
17. Gates, R.S. and T. Banhazi. 2002. Applicable technologies for controlled environment systems (CES) in livestock production. Presentation, ASAP/ISAH Joint Conference. July 7-11. Adelaide, SA, Australia.
18. Gates, R.S. 2002. Poultry and livestock housing with solid waste management. Presentation, Sixth Discover Conference on Food Animal Agriculture – Nitrogen Losses to the Atmosphere from Livestock and Poultry Operations. April 28-May 1. Nashville IN. American Dairy Science Association: Savoy, IL.
19. Gates, R.S. 2001. Ammonia volatilization as affected by broiler litter rewetting and dietary manipulation. International Symposium addressing animal production and environmental issues. Research Triangle Park. North Carolina State Animal and Poultry Waste Management Center: Raleigh, NC.
20. Gates, R.S. 2001. New tendencies related to life support systems. Keynote Speech (with paper), Agribuildings 2001 Conference. Sponsored by ASAE and CIGR. September. University of Campinas, Campinas, SP, Brazil.
21. Gates, R.S. 2001. Dietary protein and ammonia production in broiler facilities. Invited Lecture, Midwest Poultry Federation Nutrition Symposia. March 13-15. St. Paul, MN.
22. Gates, R.S. 2000. Information technology and computational intelligence in real-time applications. Invited Lecture, Inaugural Session of CIGR Section VII. December. Tsukuba City, Japan.
23. Gates, R.S. 2000. Statistics and modeling concepts for EMMS Data. Instructor, Professional Development Workshop. SE-301 Environmental Physiology (Sponsor). July. ASAE: St. Joseph, MI.
24. Gates, R.S. 2000. Introduction to psychrometric properties and processes. Tech/CPD Seminar for Parameter Generation and Control (PGC), Inc. March. Asheville, NC.
25. Gates, R.S. 2000. Manipulação da Dieta Avícola Considerando a redução na emissão de poluentes ao ambiente (Poultry diet manipulation to reduce output of pollutants to environment). Invited Lecture, sponsored by EMBRAPA. April. Concordia, Brazil.
26. Tuttle, J., R.S. Gates, L.W. Turner, and G.M. Turner. 1989. Heat and moisture production of day old leghorn-type chicks. Presentation, 78th Annual Meeting of the Poultry Science Association, Madison, WI. July 25-28.

OTHER PUBLICATIONS AND REPORTS

1. Colliver, D., J. Bush, A. Davis, M. Montross, R. Fehr, R. Gates, G. Halich, and S. Nokes. 2008. Kentucky resources to meet energy needs of the 25’x'25 Initiative. Biosystems and Agricultural Engineering No. AEN-93, University of Kentucky: Lexington, KY.
2. Zhang, H., R.S. Gates and D.G. Colliver. 1995. Development and documentation of a psychrometric Turing machine. Department of Biosystems and Agricultural Engineering, Agricultural Experiment Station Paper No. RIS 95-10. University of Kentucky: Lexington, KY.
3. Colliver, D.G., H. Zhang, R.S. Gates, and T.K. Priddy. 1994. Design data for the 1%, 2 1/2% and 5% occurrences of extreme dew-point temperature, with area coincident dry-bulb temperature. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE). Project ASHRAE 754-RP, Volumes 1, 2 and 3 Draft Final Report. Approximately 900 pages.
4. Burks, T.F., L.W. Turner, W.L. Crist, J.L. Taraba, and R.S. Gates. 1988. Simulating cow throughput and labor efficiency in the dairy parlor. Dairy Research Report, University of Kentucky, College of Agriculture, Agricultural Experiment Station: Lexington, KY.

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