PICOGRAM v. 77

and Abstracts

Chemistry for and from Agriculture

American Chemical Society

238th National Meeting and Exposition

August 16-20, 2009

Washington, DC, USA

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- Company Logo listed in Inside Cover of PICOGRAM as Patron
- Company name listed within the PICOGRAM on Award page and nomination form and within the Technical program
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- Option to place sponsor table within award symposium room
- Acknowledged at Award presentation
- 5 AGRO memberships

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- Company Logo listed in Inside Cover of PICOGRAM as Patron
- 1 Half page ad in PICOGRAM
- Logo on website sponsor page
- 2 AGRO memberships

Symposium Sponsor – AGRO has a variety of symposia at the National meetings falling into our standing topic areas.
- Company Logo listed in Inside Cover of PICOGRAM
- Company Name listed within the Technical program with symposium
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Bronze

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- Signage at the Coffee Breaks
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- Listed on Hospitality Committee page of the PICOGRAM

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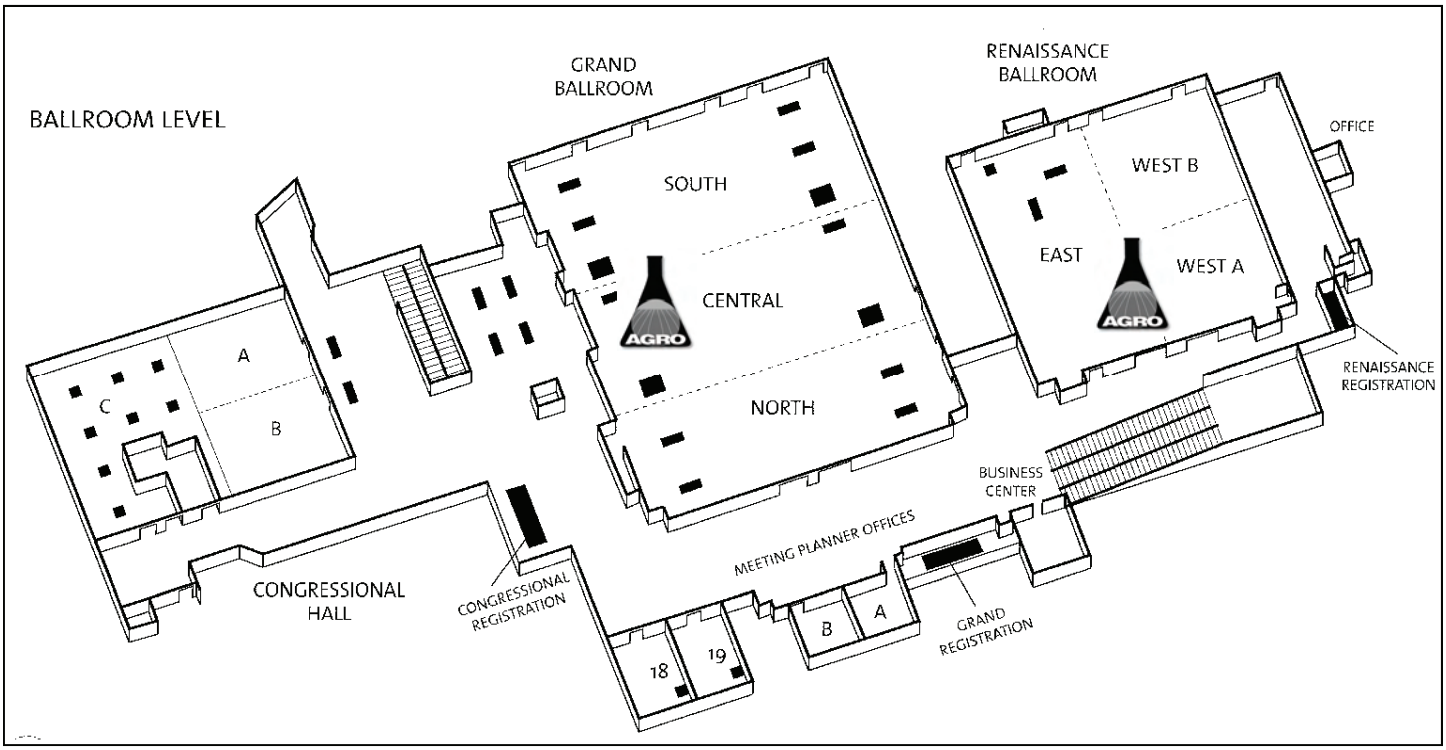
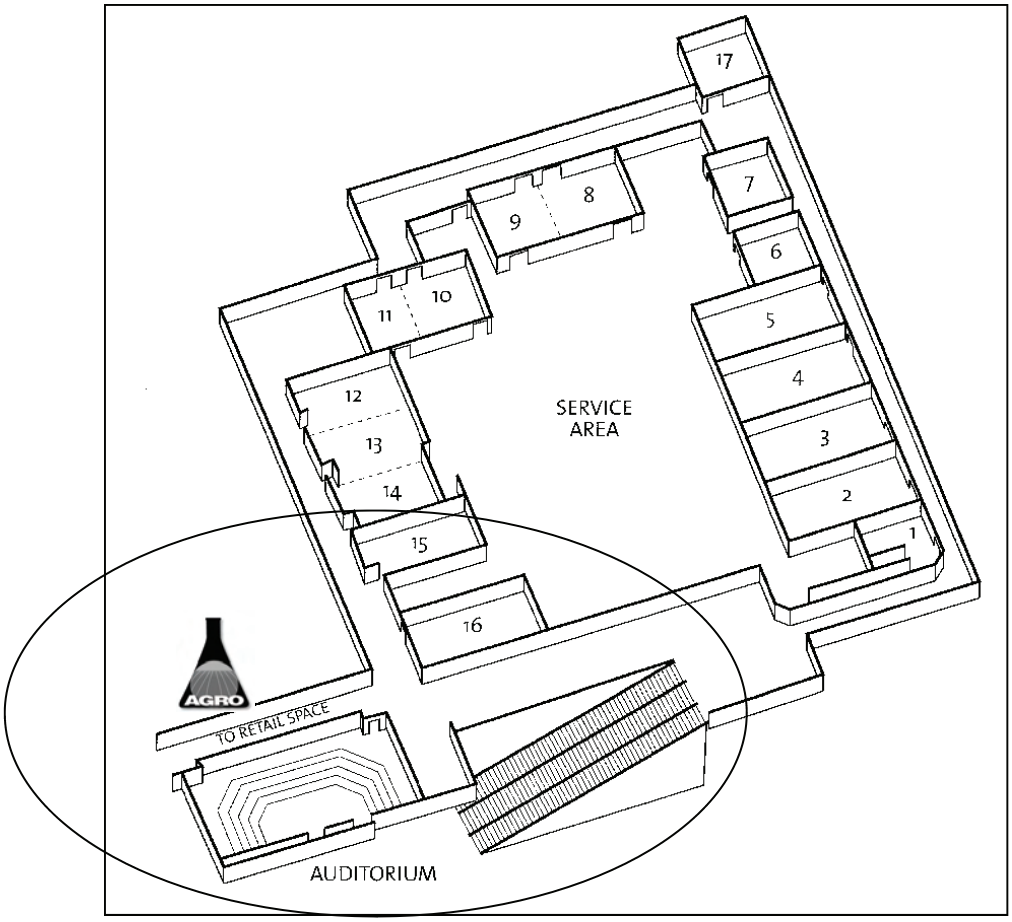
Renaissance Washington

Ballroom Level



Meeting Room Level



FALL 2009 AGRO MEETING SCHEDULE

Technical Program: page 69; Abstracts: page 89

SYMPOSIA & MEETINGS: Renaissance Washington across from the Convention Center
Auditorium (A); Grand Ballroom – South (GBS), Central (GBC); Renaissance – East (RE), West A (RWA)
SCI-MIX: Washington Convention Center

SYMPOSIUM OR SESSION	ORGANIZER(S)	Rm	Sun	Mon	Tue	Wed	Thu
Application of Natural Products in Organic Farming	K Chauhan SO Duke	GBS	A				
Organic Phosphate Transport, Fate, and Impact on the Chesapeake Bay	L Heighton, WF Schmidt	GBC	A				
Recent Developments in Invertebrate and Vertebrate Repellents	GE Paluch, JR Coats, JJ Johnston	RWA	D				
Biotechnology Risk Assessment: Minding and Managing the Threats Around Us	S Ripp	A	P				
AGRO New Investigator Award/New Developments and Issues in Agrochemical Science	EL Arthur, AS Felsot	GBS	P				
Agrochemical Residue and Metabolism Chemistry	DJ Smith, TA Wehner, JJ Johnston	GBC	P				
International Award for Research in Agrochemicals: Don Wauchope and Friends - Reflections on the Future of Pesticide Environmental Chemistry	AS Felsot	A		D	D	A	
Insect Management in Medical, Veterinary, and Urban Settings	S Cope, SO Duke, D Strickman	RWA		A			
AGRO Division Poster Session	EL Arthur, JJ Johnston	RE		A			
Government Collaborations in Scientific Research, Regulations, and Communications	JM Van Emon	GBC		D			
Lawrence A. Burns Memorial Symposium on Advances in Environmental Modeling of Pesticides	TS Ramanarayanan, RD Parker	RWA		P			
Solvents in Aquatic Toxicology Testing	J Green, SR Mortensen	GBS		P			
Sci-Mix	EL Authur	CC		E			
Agricultural Research in Australia: Critical Issues Leading up to the 12th IUPAC International Congress on Pesticide Chemistry in Melbourne	KD Racke, LL McConnell, R Hill	RWA			D		
Challenges and Initiatives in Harmonizing Maximum Residue Levels (MRLs) Across the World	C Peterson, K Racke, J Sandahl, J Callahan	GBS			D		
Advances in Biofuels and Bioproducts: Life Cycle Analysis and Sustainability	C Hapeman, J Seiber, J Massey, L Schwartz	GBC			D		
Sterling B. Hendricks Memorial Lectureship	SO Duke, MH Tunick, K Kaplan	GBC			A		
Managing Agricultural Gas and Particle Emissions	McConnell, Yates, Trabue, Hapeman, Gunasekara	RWA				D	D
Exposure to Chemicals in Urban Aquatic Environments	SH Jackson, P Hendley, JH Massey	GBS				D	
Non-dietary Human Exposure and Risk Assessment	ME Krolski, C Lunchick	GBC				D	A
Advances in Geospatial Risk Assessment and Techniques	G. G. Hoogeweg	A				P	
Catfish Aquaculture: Producing Safe, Delicious and Nutritious Food	KL Armbrust, JJ Johnston	GBS					D
Monitoring & Modeling Atrazine Ecological Exposure Potential	P Hendley	A					D
Soil Bound Residues and Relevance to Environmental Exposure	SG Mislankar K Malekani	GBC					P

Legend: A = AM; P = PM; D = AM/PM; E = EVE

Table of Contents

Notes from the Communications Chair

Greetings Fellow AGROrians! Our biggest meeting ever! How exciting! Congratulations to the Program Chair (and our Past-Program Chair) and all the organizers – you have done well. But, growing pains are not comfortable. Ellen Arthur has had more people to contact, more sessions and rooms to organize and to watch over, more organizers with more speakers, more coffee to serve, and yes, a SMALLER BUDGET per session.

Budgets being what they are, **we are trying an experiment with this volume.** The electronic version of the PICOGRAM will be made available by mid-July, a full month before the meeting, and hard copy will be available to meeting participants at the AGRO desk. This is similar to how ACS handles the National Program guides. Those who pick up a PICOGRAM will not receive another copy via snail mail, but those who cannot attend will be mailed a copy after the meeting. We look forward to your feedback – from both those who attend and do not attend the meeting.

Now more than ever AGRO needs volunteers. **WE NEED YOU TO GET INVOLVED!** For example, several openings are available on the Communications Team. If you are an electronic-only person, work on the website – we especially need you if you are an efficient manipulator and organizer of electronic files. The website requires frequent updates and needs someone to feed the contractor those frequent updates. ***Laura McConnell*** is handling this at present, but we really need someone who can step up to the plate, knows computer graphics well, can run with this, and, most importantly, is willing to commit the time. Laura has also picked up managing the ads in the PICOGRAM as a member of ***Scott Jackson's Sponsors and Patrons Team***.

Jay Gan joined the Communications Team this year and edited most of the abstracts over a period of just over a week. He would have had more time but we all submit our abstracts at the last minute – unintended consequences – we all could do better on this item. For several years, ***Sharon Papiernik*** has gathered all the award information for the PICOGRAM and website and has had to twist a few arms quietly, but firmly, to get people to submit their bio and/or picture.

You don't need to be an Executive Committee member to do executive work for the Division! *The tasks are many and workers few.* Come talk to an officer or EC member today. We can show you how to get involved and you won't regret it! Effective communication is how we will survive and reach our highest potential.

Enjoy the meeting and my adopted home town!

CJ Hapeman

Cathleen J. Hapeman, Chair
Communications Committee/PICOGRAM Editor

From the Chair's Desk

Kevin L. Armbrust

As you will read in Ellen's note, we have a great program planned for DC. It promises to be one of our biggest yet. As always our business meeting is scheduled for Sunday evening and this year we will have a number of big decisions to make.

I do want to take this opportunity to preview one important item. One of the biggest issues to discuss will be our path forward with the annual meeting. We are now into the second year of our three year experiment of programming at one national meeting a year. In spite of the economy, Philadelphia was a very good meeting for us with three concurrent sessions most of the week. Washington DC will be big also, and preliminary information from symposia proposed for the national meeting in San Francisco in March of 2010 indicates that this meeting may be as big if not bigger then DC. We have voted not to program in Boston for the fall of 2010 and need to decide what we want to do in 2011.

The first thing ***we need to decide is whether to continue on the track with one meeting each year or go back to two meetings per year***. The process we are going to use to come to this decision was discussed in a conference call of the program committee in April. One individual will present the merits of programming at one meeting a year and a second individual the merits of programming at two meetings per year. Chris Peterson has agreed to then moderate a discussion session and the executive committee will have to vote on this.

If we vote to continue programming at one meeting per year then we also need to decide what to do to after San Francisco. The spring meeting in 2011 is in Anaheim and the fall meeting is in Denver. Other activities we have also committed to be involved with are the IUPAC meeting in Melbourne, Australia July of 2010 and Pacifichem in Hawaii in December of 2010. At this point I am not aware of any international venues or other activities for 2011, but these should be brought into the discussion if they exist. ***Everyone should be thinking about this and discuss it with the officers or executive committee members.***

If we do continue to program at one meeting per year, the officers (or at least the chair) should go to the other meeting as well. This past spring I attended the National Meeting in Salt Lake City, and although we were not programming, I found that I was just as busy at this meeting as any other. There are a number of governance and other committee functions in the national organization where our presence is typically requested; however it is virtually impossible to attend these at meetings where the division is conducting programming activities. I was able to meet with other divisions as well and promote many of our activities to them as well as the national organization. This is an important part of keeping and maintaining our visibility within ACS.

Thanks to all who have contributed to making our Division a success now and for laying the groundwork for success into the future.

Kevin Armbrust

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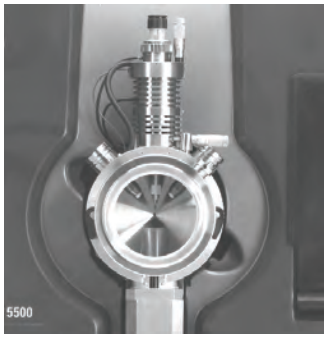

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Hospitality Committee Report

Coffee Lounge in Philadelphia

Ten companies graciously donated a total of $2,050 to support our coffee lounge held during the technical sessions in Philadelphia. We thank them for their generosity. The coffee lounge offers an additional forum for further discussion of ideas and provides opportunities for networking and viewing of literature displayed in the hospitality desk area. If you wish to join these companies in supporting our coffee lounge, please contact any of our committee members. Those contributing to the coffee lounge are:

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AGRO Social at Philadelphia

The AGRO Division Awards & Social was held at the Liberty Room in the Crowne Plaza City Center. Dr. David Soderlund was recognized as the recipient of the ACS International Award for Research in Agrochemicals and Dr. Allan Felsot as the recipient of the AGRO Fellow Award. We also introduced Dr. Ashli Brown as the winner of the New Investigator Award and the winners of the AGRO Education Awards to all the revelers in attendance. Our inevitable prize drawing could not be stopped again and drew smiles from surprised winners.

HOSPITALITY COMMITTEE MEMBERS - James Brady, Julie Eble, Joe Massey & Patricia Rice
SOCIAL CO-CHAIRS - Al Barefoot & Jeff Jenkins

PAST WINNERS OF THE AGRO DIVISION FELLOW AWARD

1971	Dr. Louis Lykken
	Dr. Tom H. (Bucky) Harris
	Dr. Herman Beckman (Posthumous)
1972	Mr. Wendell F. (Bud) Phillips
	Dr. Don G. Crosby
	Dr. Elvins Y. Spencer
1973	Mr. Roger C. Blinn
	Dr. Philip C. Kearney
	Dr. Julius J. Menn
1974	Dr. Morton Beroza
	Dr. James P. Minyard, Jr.
	Dr. Joe C. Street
1975	Dr. Hank F. Enos
	Dr. Maurice B. Green
	Dr. Charles H. Van Middelem
1976	Dr. Marguerite L. Leng
	Dr. Jack R. Plimmer
	Dr. Gerald G. Still
1977	Dr. Gustave K. (Bob) Kohn
1978	Dr. S. Kris Bandal
	Dr. Paul Hedin
1979	Dr. Rodney D. Moss
1980	Dr. G. Wayne Ivie
	Dr. John B. Siddall (Posthumous)
1981	Dr. Robert M. Hollingsworth
	Dr. Gino J. Marco
1983	Dr. John Harvey, Jr.
1985	Mr. Henry Dishburger
	Dr. Richard C. Honeycutt
1986	Dr. Gunter (Jack) Zweig
1987	Dr. Willa Garner
1988	Dr. Jan Chambers
	Dr. James Seiber
1990	Dr. Joseph Fenyes
1991	Dr. Nancy N. Ragsdale
1992	Dr. Don Baker
	Dr. Joel Coats
	Dr. Guy Paulson
1993	Dr. Larry Ballantine
1994	Dr. James Heitz
	Dr. Ralph Mumma
	Dr. Willis Wheeler
1996	Dr. John Bourke
1998	Dr. Hank Cutler
	Mr. Paul Giesler
2000	Dr. Barry Cross
2001	Dr. Robert Hoagland
2003	Dr. Judd O. Nelson
2005	Dr. Rodney Bennett
2006	Dr. Terry D. Spittler
2007	Dr. Ann T. Lemley
	Dr. R. Don Wauchope
	Dr. John M. Clark
2008	Dr. Allan S. Felsot

Awards Committee Report

Dr. Donald Wauchope, USDA-ARS (retired), will receive the International Award for Research in Agrochemicals at the Fall, 2009 ACS meeting in Washington, D. C. for his contributions in agrochemical fate and transport and the physical processes. DuPont Crop Protection and BASF cosponsor the award, which will be presented on Monday Morning, August 17, at 8:15 am. Please join Don and his friends and colleagues in celebrating this award, including in the Awards Symposium honoring Don and reflecting on the future of pesticide environmental chemistry.

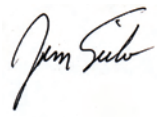
Congratulations also to **Dr. Charles Arntzen** (Arizona State University), recipient of the Sterling B. Hendricks Memorial Lectureship Award, cosponsored by the USDA Agricultural Research Service and ACS Divisions of Agrochemicals and Agricultural and Food Chemistry. The Award will be presented by Dr. Edward Knipling, Administrator of ARS, immediately preceding Dr. Arntzen's award address "Biomanufacture of nanoparticle vaccines in plants," in ceremonies starting at 11:30 am, Tuesday, August 18.

Dr. Jennifer Anderson will receive the AGRO New Investigator Award for her research concerning the mode of action of terpenoid repellency and toxicity. She will present her paper, "Characterization of acetylcholinesterase inhibition by botanically-derived terpenoids in arthropods," in the New Investigators Symposium on Sunday afternoon. This award is sponsored by Dow AgroSciences. In addition, fifteen students received the AGRO Education Travel Awards which are sponsored by Bayer CropScience.
The Awards Committee is pleased to announce the recipient of the 2010 International Award for Research in Agrochemicals, **Dr. Shinzo Kagabu**, Gifu University, Gifu, Japan. The 2010 award will be presented at the 2010 ACS National meeting scheduled for San Francisco. Dr. Kagabu is being recognized for his seminal discoveries leading to development and extensive use of the neonicotinoid insecticides. A symposium honoring Dr. Kagabu and research in this area of pesticide science is being organized by Professors John Casida and Ernest Hodgson.

Please consider nominating a deserving individual for future International Awards for Research in Agrochemicals (page 17) and the Sterling B Hendricks Lectureship (page 19). The Awards Committee is also accepting nominations for the Division Fellow Award, which recognizes members whose dedicated and enthusiastic service has kept the Division moving forward (see below). Application procedures for the New Investigator Award and the AGRO education Travel Awards can be found on pages 21 and 23, respectively.

Congratulations to Drs. Wauchope, Arntzen, Anderson, and Kagabu, and to our student award winners.

On behalf of the AGRO Awards committee,



James N. Seiber, Chair
Awards Committee

CALL FOR NOMINATIONS
AGRO Division Fellow Award

The AGRO Division has established the ***Fellow Award*** to recognize its members whose dedicated and enthusiastic service has kept the Division moving forward.

Criteria shall be –

Continued and substantial contributions of time, talents, and service to the Division of Agrochemicals, ACS, and agrochemical science over a period of at least six years.

Nominations include a letter, noting the contributions to the Division, and current *curriculum vitae*. Deadline for submitting nominations is May 31 of each year. Contact the Awards Committee for further information.

Dr. James Seiber, Chair
Food Science Department
University of California
One Shields Avenue
Davis, CA 95616-8598
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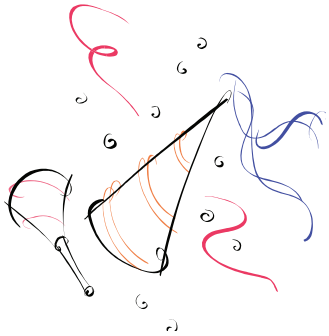

Meet with Friends Old and New
&
Celebrate AGRO's Award Winners

International Award for
Research in Agrochemicals
Dr. Don Wauchope

AGRO New Investigator Award
Dr. Jennifer Anderson

AGRO Education Awards

Fun, Food, Good Company, Door Prizes, and a Cash Bar
6:00 - 8:00 pm Tuesday, August 18
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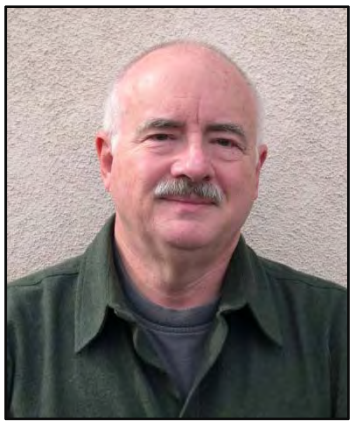

Dr. ROBERT DONALD WAUCHOPE

Don Wauchope has had a 35-year research career with the USDA Agricultural Research Service (ARS) using basic chemical principles to clarify the behavior of pesticides in the environment. Following graduate study in inorganic and physical chemistry, and a postdoctoral fellowship in agricultural chemistry under Virgil Freed at Oregon State University, Don joined the ARS Southern Weed Science Laboratory at Stoneville, Mississippi in 1972 under weed scientist Chester McWhorter, later moving to the Nematology/Weed Science group at Tifton, Georgia under Bill Johnson and then the Southeast Watershed Research Laboratory at Tifton under Tim Strickland.

Initially, Don focused on arsenical pesticides and used these compounds in innovative ways as environmental tracers. This work broadened into the study of the environmental fate of a wide range of pesticides, where Don contributed significant research on the behavior of pesticides in soils, pesticide application efficiency and efficacy, and nonpoint pollution of water by agricultural pesticides. Don is the foremost authority in the world on pesticide runoff. His 1978 review of pesticide runoff from agricultural fields is heavily cited and set the research agenda for this area. His pesticide properties database for environmental pollution prediction is in use worldwide by water-quality agencies, researchers, modelers, consultants, and industry.

Don has authored 205 papers and abstracts. He contributed to CREAMS, ARS' most famous environmental simulation model, and developed the pesticide processes modules of the ARS RZWQM and REMM models. He has been a global spokesman for the use of modeling in pesticide risk assessments. Don has been a team leader on USDA and interagency taskforces and other national projects and on international interdisciplinary research projects for the International Union of Pure and Applied Chemistry. He has served on many scientific society committees, organizing symposia and technical programs, and publishing reports on the state of technology and its interface with policy and regulatory programs. He is a Fellow of the Weed Science Society of America and Past President and Fellow of the Agrochemicals Division. Don retired in 2006 and is now consulting with the USDA Foreign Agricultural Service and the Borlaug Institute of Texas A&M University on certification of official food pesticide residue analytical laboratories in developing nations in support of agricultural trade.

A two and half day symposium entitled

Don Wauchope and Friends:
Reflections on the Future of Pesticide Environmental Chemistry

will be held in Don's honor beginning Monday, August 17, at 8:15 am in the Renaissance Washington Auditorium

The AGRO Division is grateful for the sustained support of the International Award sponsors

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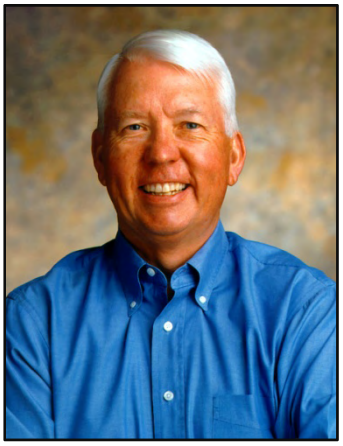

Dr. Charles J. Arntzen was appointed to the Florence Ely Nelson Presidential Endowed Chair at Arizona State University (ASU) in Tempe in 2000. He served as the Founding Director of the Biodesign Institute (previously identified as the Arizona Biomedical Institute) from 2001-2003, and served as the Co-Director of the Center for Infectious Diseases and Vaccinology with Professor Roy Curtiss until 2007. Prior to joining ASU, Dr. Arntzen served as President and CEO of Boyce Thompson Institute -- a not-for-profit corporation affiliated with Cornell University. Earlier administrative experience included service as Director of Research at the Dupont Company. He was also Deputy Chancellor for Agriculture; Dean, College of Agriculture and Life Sciences; and Director of the Texas Agricultural Experiment Station in the Texas A&M University System.

Dr. Arntzen was elected to the U.S. National Academy of Sciences in 1983 and to the National Academy of Sciences in India the following year. He is a fellow of The American Association for the Advancement of Science and received the Award for Superior Service from the U.S. Department of Agriculture for international project leadership in India. Dr. Arntzen has received honorary doctorate degrees from Purdue University, the University of Minnesota, and the Hebrew University in Jerusalem.

Dr. Arntzen was a member of the Executive Committee of the Board of Governors of the University of Chicago for Argonne National Laboratory and served as chairperson of their Science and Technology Advisory Committee. He served as chairman of the National Biotechnology Policy Board of the National Institutes of Health, as chairman of the National Research Council's Committee on Biobased Industrial Products, and on the National Research Council's Committee on Space Biology and Medicine. He served for eight years on the Editorial Board of SCIENCE. He currently serves as a Distinguished Advisor on the Council for Biotechnology, and on the Board of Directors of the National Center for Genome Resources. In 2001 he was appointed as a member of President George W. Bush's Council of Advisors on Science & Technology, and in 2004 received a Presidential appointment to serve on the National Nanotechnology Oversight Board; both of these appointments continued until 2009.

Dr. Arntzen's private sector service includes past membership on the Board of Directors of DeKalb Genetics (prior to sale to Monsanto), and Board of Directors and Board of Scientific Advisors for Axis Genetics in Cambridge, UK. He currently serves on the Board of Directors of VAXX, Inc, Advanced BioNutrition, Inc. and Performance Plants, Inc. and serves on the Advisory Board of the Burrill and Company's Agbio Capital Funds and The Nutraceuticals Fund.

Dr. Arntzen will deliver his lecture immediately following presentation of the Sterling Hendricks Award on August 18 at 11:30 am in the Renaissance Washington – Grand Ballroom Central

A reception will follow at 12:45 pm

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2009 AGRO
New Investigator Award

Presented by the AGRO Division of ACS
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Dr. Jennifer Anderson is the 2009 winner of the New Investigator Award sponsored by the ACS AGRO Division. Dr. Anderson is currently a post doctoral scientist working on a variety of research problems in the laboratory of Dr. Joel Coats at Iowa State University. She received her doctorate in environmental toxicology from Texas Tech University in 2007. Her research in Texas focused on the characterization of the effects of different environmental contaminants, such as metals, polycyclic aromatic hydrocarbons (PAHs), explosives (RDX) and chlorinated hydrocarbons (trichloroethylene), on the structure and function of microbial communities in soils. Dr. Anderson's interest in microbial ecology and the effects of anthropogenic stress led to applied studies in bioremediation of trichloroethylene by aerobic degradation and the *in situ* degradation of gasoline from leaking underground storage tanks.

During her tenure at Iowa State University, Dr. Anderson's research interests have expanded to 1) pesticide mode of action; 2) the effects of veterinary antibiotics on aquatic non-target organisms; and 3) plant-based approaches for mitigating pesticide and herbicide contamination of soils and surface water. In addition to research, she has taken on the role of teacher and advisor of other students and her leadership skills have proven invaluable.

At the 238th national meetings of the ACS in Washington, DC, Dr. Anderson will present a paper titled "Characterization of acetylcholinesterase inhibition by botanically-derived terpenoids in arthropods". Her presentation will be part of the Sunday afternoon the combined AGRO New Investigator Award and New Developments / Issues in Agrochemical Science Symposium. Dr. Anderson's research complements the long-standing research on biologically-derived insecticides ongoing in Dr. Coats' lab. Her work is a fundamental aspect of introducing new ecologically-compatible pest control products to market. It also illustrates the versatility of Dr. Anderson's skills and interests, further defining her commitment to advancing the interdisciplinary mission of the AGRO Division.

Dr. Anderson will present her paper in the
New AGRO New Investigator Award Symposium on
Sunday afternoon, August 16 in the
Renaissance Washington -- Grand Ballroom South

The AGRO Division is grateful for the sustained support of the New Investigator Award sponsor

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1969 Dr. John E. Casida, University of California, Berkley
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1971 Dr. Robert L. Metcalf, University of Illinois
1972 Dr. Ralph L. Wain, Wye College, University of London, England
1973 Dr. Hubert Martin, British Crop Protection Council, England
1974 Dr. T. Roy Fukuto, University of California, Riverside
1975 Dr. Michael Elliot, Rothamsted Experiment Station, England
1976 Dr. Morton Beroza, USDA-ARS (retired)
1977 Dr. Francis A. Gunther, University of California, Riverside
1978 Dr. Julius J. Menn, Stauffer Chemical
1979 Mr. Milton S. Schecter, USDA (retired)
1980 Dr. Minuro Nakajima, Kyoto University, Kyoto, Japan
1981 Dr. Philip C. Kearney, USDA-ARS, Beltsville, Maryland
1982 Dr. Jack R. Plimmer, USDA-ARS, Beltsville, Maryland
1983 Dr. Karl Heinz Buechel, Bayer AG, Germany
1984 Dr. Jacques Jean Martel, Roussel Uclaf, Paris
1985 Dr. Junshi Miyamoto, Sumitomo Chemical Co., Japan
1986 Dr. James Tumlinson, USDA-ARS, Gainesville, Florida
1987 Dr. Fumio Matsumura, Michigan State University
1988 Dr. Ernest Hodgson, North Carolina State University
1989 Dr. Toshio Narahashi, Northwestern University
1990 Dr. David Schooley, University of Nevada, Reno
1991 Dr. Stuart Frear, USDA-ARS, Fargo, North Dakota

PAST WINNERS OF THE ACS INTERNATIONAL AWARD FOR RESEARCH IN AGROCHEMICALS

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1992-F Dr. Bruce Hammock, University of California, Davis
1993-S Dr.Morifuso Eto, Kyushu University, Fuoka, Japan
1994-F Dr. Toshio Fujita, Kyoto University, Kyoto, Japan
1995-S Dr. Mohyee Eldefrawi, University of Maryland, Baltimore
1995-F Dr. Koji Nakanishi, Columbia University, New York
1996-S Dr. Günther Voss, Ciba, Basel, Switzerland
1996-F Dr. Klaus Naumann, Bayer, Leverkusen, Germany
1997-S Dr. Fritz Führ, Jülich, Germany
1997-F Dr. Izuru Yamamoto, University of Tokyo, Japan
1998-S Dr. George Levitt, DuPont, Wilmington, DE
1998-F Dr. Leslie Crombie, University of Nottingham, England
1999-S Dr. Don Baker, Zeneca, Richmond, CA
1999-F Dr. James Seiber, University of Nevada, Reno
2000-S Dr. George P. Georghiou, University of California, Riverside
2000-F Dr. Herbert B. Scher, Zeneca
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2003-F Dr. Hideo Ohkawa, Kobe University, Japan
2004-S Dr. Stephen Duke, USDA-ARS, Oxford, Mississippi
2004-F Dr. John Marshall Clark, University of Massachusetts
2005-S Dr. Robert Krieger, University of California, Riverside
2005-F Dr. Janice E. Chambers, Mississippi State University
2006-S Dr. Joel Coats, Iowa State University
2006-F Dr. Isamu Yamaguchi, Agricultural Chemicals Inspection Station, Tokyo Japan
2007-S Dr. Gerald T. Brooks, West Sussex, UK
2007-F Dr. Fredrick J. Perlak, Monsanto
2008 Dr. David M. Soderlund, Cornell University

CALL FOR NOMINATIONS
ACS INTERNATIONAL AWARD FOR RESEARCH IN AGROCHEMICALS

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The ACS International Award for Research in Agrochemicals is given to a scientist who has made outstanding contributions to the field of agrochemicals at the international level. Their vision and sustained contributions will have opened new horizons for other investigators in their field and beyond.

- The ***nomination letter*** will include the following statement: "I hereby nominate [insert first, middle, last name] as a candidate for the ACS International Award for Research in Agrochemicals." It will also include the ***nominee's birthplace, date of birth, citizenship, business address*** and a **description** (200 – 1000 words) of the reasons why the nominee should receive this award, stressing the individual's major accomplishments.

- Include a ***curriculum vitae*** of the candidate that includes: places and nature of employment, professional affiliations, honors and awards received, and a list of publications and patents.

- Nominations often include ***one or two letters of support***, although this is optional.

- Please provide 11 copies.

Deadline: Nominations should be received by the committee chair by ***December 31*** of each year. Balloting will be conducted in January/February and results will be announced in the spring of the following year.

The nominating official(s) should be prepared to assist in organizing a symposium at the National ACS meeting in honor of the awardee.

Please, return this completed form to:

Dr. James Seiber, Chair
Food Science Department
University of California
One Shields Avenue
Davis, CA 95616-8598
530-752-1465 – phone
jnseiber@ucdavis.edu

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1982 Warren L. Butler, Professor of Biology and Past Chairman, Biology Department, University of California at San Diego

1983 Melvin Calvin, Nobel Laureate and University Professor of Chemistry, University of California at Berkeley

1984 Frederick Ausubel, Professor of Genetics, Harvard Medical School and Massachusetts General Hospital

1985 Alan Putnam, Professor, Department of Horticulture and Pesticide Research Center, Michigan State University

1986 Ralph Hardy, President, Boyce Thompson Institute for Plant Sciences, Cornell University, and Deputy Chairman, BioTechnica International

1987 Mary-Dell Chilton, Director of Biotechnology Research for Ciba-Geigy Corporation, Research Triangle Park, North Carolina

1988 Bruce N. Ames, Chairman, Department of Biochemistry, University of California at Berkeley

1989 Sanford A. Miller, University of Texas Health Science Center at San Antonio

1990 Roy L. Whistler, Emeritus Professor, Purdue University

1991 Peter S. Eagleson, Professor of Civil Engineering, Massachusetts Institute of Technology

1992 John E. Casida, Professor of Chemistry and Toxicology, University of California at Berkeley

1993 Philip H. Abelson, Deputy Editor, *Science*, and Scientific Advisor to AAAS

1994 Wendell L. Roelofs, Liberty Hyde Bailey Professor of Insect Biochemistry, Cornell University

1995 Winslow R. Briggs, Director Emeritus, Department of Plant Biology, Carnegie Institution of Washington

1996 Hugh D. Sisler, Professor Emeritus, Department of Plant Biology, University of Maryland

1997 Ernest Hodgson, Head, Department of Toxicology, North Carolina State University

1998 Martin Beroza, Chief, Organic Chemicals Synthesis Laboratory, Agricultural Research Service

1999 Bruce D. Hammock, Professor, Department of Entomology, University of California at Davis

2000 William S. Bowers, Professor, Department of Entomology and Chemical Ecology, University of Arizona

2001 Malcolm Thompson, Research Chemist, USDA-ARS, Beltsville, Maryland (retired)

2002 Ervin E. Leiner, Professor Emeritus, Biochemistry Department, University of Minnesota

2003 Dr. Kriton Kleanthis Hatzios, VA Agricultural Experiment Station

2004 Dr. Robert L. Buchanan, Food & Drug Administration

2005 Dr. Donald Sparks, University of Delaware

2006 Dr. Stanley B. Prusiner, Institute for Neurodegenerative Diseases, University of California, San Francisco

2007 Dr. Bruce E. Dale, Department of Chemical Engineering & Materials Science, Michigan State University

2008 Fergus M. Clydesdale, Department of Food Science, University of Massachusetts, Amherst

Sterling B. Hendricks Memorial Lectureship Award
CALL FOR NOMINATIONS

Co-Sponsored by the AGRO & AGFD Divisions

The USDA-Agricultural Research Service (ARS) is seeking nominations for the 2010 Sterling B. Hendricks Memorial Lectureship Award. This Lectureship was established in 1981 by ARS to honor the memory of Sterling B. Hendricks and to recognize scientists who have made outstanding contributions to the chemical science of agriculture. Dr. Hendricks contributed to many diverse scientific disciplines, including soil science, mineralogy, agronomy, plant physiology, geology, and chemistry. He is most frequently remembered for discovering phytochrome, the light-activated molecule that regulates many plant processes. The lecture should address a scientific topic, trend, or policy issue related to agriculture. Deadline is **November 4, 2009.**

The AGRO Division and the Agricultural & Food Chemistry Division (AGFD) co-sponsor the Lecture which will be held in a joint session of these divisions. The lectureship is presented at an AGFD symposium in even-numbered years and in an AGRO symposium in odd-numbered years. The award includes an honorarium of $2000, a bronze medallion, and expenses to attend the meeting.

Nominees will be outstanding senior scientists in industry, universities, consulting, or government positions. *Current ARS employees are not eligible.* The Award will be presented during an American Chemical Society National Meeting held in 2010 prior to the Lecture. Giving the presentation is a requirement of the honor.

A **Nomination Package** includes:

- A letter explaining the nominee's contributions to chemistry and agriculture,
- A current *curriculum vitae* (hard copy only)

Nomination letters may be sent electronically to:

Kim Kaplan, Lecture Coordinator
kim.kaplan@ars.usda.gov

Hard copy nominations and *curriculum vitae* are to be submitted via courier to:

Kim Kaplan, Lecture Coordinator
ARS Information Office
Room 1-2253, Mail Stop #5128
5601 Sunnyside Ave
Beltsville, MD 20705
301-504-1637 – phone

United States Department of Agriculture
Agricultural Research Service
www.ars.usda.gov

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CALL FOR NOMINATIONS
AGRO NEW INVESTIGATOR AWARD

Sponsored by Dow AgroSciences

The AGRO Division seeks nominations for the New Investigator Award to be awarded at the ACS meeting in San Francisco in March 2010. The purpose of the New Investigator Award is to recognize scientists who have obtained a doctoral degree and are actively conducting academic, industrial, consulting, or regulatory studies.

The Division is interested in work on all aspects of agrochemicals which are broadly defined to mean pesticides of all kinds (e.g., chemical pesticides, biopesticides, pheromones, chemical attractants, fumigants, plant incorporated protectants, disinfectants) as well as biotechnology-derived crops (e.g., Bt crops, Roundup Ready crops, etc.). Studies of veterinary pharmaceuticals and antibiotics are included in the Division's mission.

AGRO is also interested in chemical products made from agricultural commodities and byproducts including biofuels and the issues surrounding production. The categorical areas of study related to agrochemicals are very broad and encompass environmental chemistry, toxicology, exposure assessment, risk characterization, risk management, and science policy. The Division especially encourages submissions related to public health protection as well as crop, livestock, aquaculture, and wildlife protection.

- *To be eligible for the award, the scientist must have obtained his or her doctorate no more than five years before the time of the Spring ACS national meeting.* Thus, for 2010, applications will be considered from scientists who have obtained their doctorates no earlier than the year 2005.

- The award winner will be expected to deliver an oral presentation in their area of interest in one of the AGRO Program sessions.

- The award winner will receive a $1000 honorarium, a commemorative plaque, one-year complementary membership in the AGRO Division, a meeting registration fee waiver, and reimbursement for travel expenses in association with the DC meeting.

Applications for the New Investigator Award will consist of the following elements:

1. Submission of a maximum **five-page paper describing the area of research** or other work relevant to the broad mission of the AGRO Division. The paper may be structured as a research paper (i.e., contains the main elements of a typical journal article) or as a critical review of one's particular contributions to the scientific fields covered by the AGRO Division.

2. Submission of a **150 word abstract** for the submitted paper.

3. Submission of at least **one letter of recommendation** from a current supervisory scientist (e.g., a business manager, a departmental chair, etc.)

4. Both the paper and letter of recommendation should be **submitted no later than November 2, 2009** to Dr. Allan Felsot via email, afelsot@tricity.wsu.edu, for consideration of an award at the Spring meeting in San Francisco.

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2009 AGRO EDUCATION AWARDS FOR STUDENT TRAVEL

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Congratulations to all our travel grant winners!

First and second place winners will be announced at the
AGRO Awards & Social on Tuesday evening.
Abstracts can be found beginning on page 104.

S. M. Adkins, P. B. Ryan. Determination of pesticide degradation in raw and processed foods. *Department of Chemistry, Emory University.* AGRO 83

Z. Chen, O. Unoje, L. Cui, K. Aratani, R. I. Krieger. DDA in chickens, a pilot study as a DDT biomarker. *Department of Entomology, Environmental Toxicology Graduate Program, University of California-Riverside.* AGRO 82

P. R. Daga, F. E. Dayan, S. O. Duke, R. M. Lee, P. J. Tranel, R. J. Doerksen. Computational approaches elucidate how a glycine deletion enables plant protoporphyrinogen oxidase to resist herbicides. *Department of Medicinal Chemistry, School of Pharmacy, University of Mississippi, University.* AGRO 81

A. D. Gross, M. J. Kimber, P. Ribeiro, J. R. Coats. A green chemistry approach to targeting *Periplaneta americana's* octopamine receptor 1. *Department of Toxicology/Entomology, Iowa State University. AGRO 76*

A. M. Hussey, B. A. Kimball. Tannin determination in tamarisk and other foliage *Monell Chemical Senses Center, Philadelphia, PA.* AGRO 89

L. J. Jenson, S. L. Paulson, J. R. Bloomquist. Induction and characterization of ion channels in Sf21 cells. *Department of Entomology, Virginia Polytechnic Institute and State University.* AGRO 87

A. M. Jessick, T. B. Moorman, J. R. Coats. Development of analytical techniques for the detection and quantification of erythromycin in environmental matrices. *Department of Entomology, Iowa State University.* AGRO 84

M. H. Littke, J. LePage, V. Hebert. Reducing near-field agricultural fumigant emissions through changes in regional application practices. *Food and Environmental Quality Laboratory, Washington State University.* AGRO 88

I. J. Murphy, J. Anderson, J. R. Coats. Uptake and degradation of atrazine in switchgrass (*Panicum virgatum*). *Department of Entomology, Iowa State University.* AGRO 77

J. M. Mutunga, J. Hartse, M. Ma, L. Srigiriraju, D. M. Wong, B. T. Jackson, T. D. Anderson, S. L. Paulson, P. R Carlier, J. R. Bloomquist. Highly selective carbamates for *Anopheles gambiae* acetylcholinesterase: Effects of pharmacokinetics on toxicity to mosquitoes. *Department of Entomology, Virginia Polytechnic Institute and State University.* AGRO 86

G. T. Nino de Guzman, C. J. Hapeman, A. Torrents, K. L. Brubaker. Transport, distribution, and interaction of pesticides, nutrients, and select pathogens in the Choptank River. *Department of Civil and Environmental Engineering, University of Maryland, College Park, MD.* AGRO 90

D. R. Swale, P. R. Carlier, J. Hartsell, M. Ma, J. R. Bloomquist. Biochemical and toxicological assessment of newly designed insect acetylcholinesterase inhibitors against mosquito vectors and agricultural pests. *Department of Entomology, Virginia Polytechnic Institute and State University.* AGRO 78

F. Tong, J. R. Coats. Effects of monoterpenoids on $^{36}Cl^-$ uptake of central nerve cords in the American cockroach. *Department of Entomology, Iowa State University.* AGRO 85

C. Trigo, W. C. Koskinen, R. Celis, J. Cornejo. Clay-based formulations to reduce the environmental impact of the herbicide terbuthylazine. *Instituto de Recursos Naturales y Agrobiología de Sevilla (CSIC), Avenida Reina Mercedes 10, 41012 Sevilla, Spain.* AGRO 80

X. Xiao, A. T. Lemley. Ciprofloxacin degradation by membrane anodic Fenton treatment. *Graduate Field of Environmental Toxicology, Cornell University.* AGRO 79

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Daniel Poux
Associate Director Outreach and Communications
AAAS Science and Technology Policy Fellowships

Wednesday 12:00 – 1:00 pm
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CALL FOR APPLICANTS
AGRO Education Awards
Sponsored by Bayer CropScience

UNDERGRADUATE & GRADUATE STUDENT RESEARCH
SUPPORT FOR POSTER PRESENTATIONS
AT THE 2010 SPRING MEETING IN SAN FRANCISCO

The AGRO Division has established an endowment fund that will be used to promote an understanding of the role of chemistry in agriculture. To address this goal, awards will be made through the Division's Education Committee

Proposals are sought for the 2010 awards. Undergraduate and graduate students will be awarded up to $600 each to help defray costs of attendance to give poster presentations at the ACS 2010 Spring Meeting, which will be held March 21-25, 2010 in San Francisco. Posters will be displayed in a special poster session of the ACS Division of Agrochemicals. First, Second and Third place winners will receive an additional cash award.

The subject of the presentation should pertain to the chemistry of the AGRO Division Topics should relate to pest management chemistry including synthesis, metabolism, regulatory, biotechnology, delivery, risk assessment, resistance, residues, mode of action, fate/behavior/transport, and agronomic practices. The AGRO Division is also interested in chemical products made from agricultural commodities and byproducts including biofuels and the issues surrounding production.

To apply, a graduate student should submit the following to be received no later than November 2, 2009 (OASYS Deadline):

1. An abstract formatted according to the directions given on the ACS website. Be sure to include name (of applicant), address, and e-mail address.

2. A two page extended abstract giving more detail of the research/presentation.

3. A short letter of nomination from the faculty advisor.

Submit items 1 and 2 to the ACS OASYS abstract submission website.
http://oasys.acs.org/

Submit item 3 as a Word or pdf file to Dr. John Johnston at john.johnston@fsis.usda.gov

Direct questions to:
Dr. John J. Johnston
USDA-FSIS
2150 Centre Ave.
Building D, Suite 320
Fort Collins, CO 80526
202-365-7175

Abstracts will be reviewed by the Education Committee.
Submitters will be notified of their selection status in January 2010

Special thanks to our sponsor for their generous contribution!

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Notes from the Program Chair

Ellen L. Arthur

The AGRO Division has a phenomenal line up of symposia for the 238th National American Chemical Society Program in Washington DC this August with four concurrent sessions running throughout most of the meeting. We will hit the ground running on Sunday morning with three very interesting symposia: Recent Developments in Invertebrate and Vertebrate Repellents; Application of Natural Products in Organic Farming; and Organic Phosphate Transport, Fate, and Impact on the Chesapeake Bay. On Sunday afternoon the symposium featuring the AGRO New Investigator Award will begin at 2 pm. Additionally on Sunday afternoon, we will be able to learn more about biotechnology risk assessment, as well as agrochemical residue and metabolism chemistry. As usual, the AGRO business meeting is scheduled for Sunday evening from 5 to 10 pm, and I look forward to seeing many of you there.

On Monday morning, the International Award for Research in Agrochemicals Symposium honoring Dr. Don Wauchope will begin at 8:15 am, and Don's award presentation will occur at 8:45 am. This symposium will continue for 2 ½ days and will be filled undoubtedly with very interesting presentations. The AGRO poster session will occur within the vicinity of our oral presentations, and will run from 8 am to 12 pm. Presenting authors should be at their posters from 10 am to 12 pm. The remaining Monday morning symposia will start at approximately 10 am and include the following topics: Insect Management in Medical, Veterinary, and Urban Settings; Solvents in Aquatic Toxicology Testing; and Government Collaborations in Scientific Research, Regulations, and Communications. Of particular interest on Monday afternoon is a presentation within the Government Collaborations symposium by Rich Hayes who is the author of the book titled A Scientist's Guide to Talking with the Media. He will speak on the topic of media training for scientists.

On Monday afternoon, there will be a symposium in memory of the late Dr. Lawrence Burns, who was an eminent ecologist at EPA Office of Research and Development in Athens, Georgia. This symposium will focus on advances in environmental modeling of pesticides. Two other symposia will be held on Monday afternoon: Solvents in Aquatic Toxicology Testing and Insect Management in Medical, Veterinary, and Urban Settings. The SCIMIX Poster Session will be held from 7 to 9 pm on Monday evening and will include 28 posters from the AGRO Division.

On Tuesday, the Sterling Hendricks Award Presentation will be presented to Dr. Charles Arntzen at 11:30 am and will be followed by his Award Lecture on the topic of biomanufacturing of nanoparticle vaccines in plants. The lineup for other symposia on Tuesday includes Challenges and Initiatives in Harmonizing Maximum Residue Levels (MRLs) Across the World; Advances in Biofuels and Bioproducts: Life Cycle Analysis and Sustainability; as well as Agricultural Research in Australia, which will highlight critical issues leading up to the 12th IUPAC International Congress on Pesticide Chemistry to be held in Melbourne, Australia in 2010. The AGRO Social will be held Tuesday evening from 6 to 8 pm and will have an Australian theme.

Wednesday's programming includes symposia on the Advancements in Geospatial Risk Assessment and Techniques; Managing Agricultural Gas and Particle Emissions; Exposure to Chemicals in the Urban Environment; and Non-dietary Human Exposure and Risk Assessment. A graduate student luncheon will be held over the noon hour on Wednesday, and we will once again hold the Brews & Blues Event following the afternoon sessions from 5 to 7 pm. Come join us for drinks, music and participation in a brainstorming event for future AGRO programming. Our strong programming continues on Thursday with additional symposia on Monitoring and Modeling Atrazine Ecological Exposure Potential; Catfish Aquaculture; and Soil Bound Residues and Relevance to Environmental Exposure.

Many thanks to everyone involved in planning, organizing, and making this AGRO Program one of our best ever. Your time and effort is a very valued resource for this Division. I look forward to seeing everyone in Washington DC. Have a great summer!

AGRO Program Committee Report

The Program Committee is made up of the Division Officers, Executive Committee members, Standing members, Volunteer members, and a Long Range Program Coordinator to keep a continuous record of past and future programming. Some names are listed twice as they are serving in more than one category. If you have an interest in serving as a volunteer member of this committee, or if you would like more information on participating in AGRO programming, please contact Ellen Arthur, Joe Massey, or one of the division officers.

A list of standing topic areas was established which reflects better the broader areas of agricultural research being addressed by AGRO. These topics will be part of each AGRO program along with our normal awards, programming, and symposia to address ACS themes for each meeting and special topics of emerging or continuing interest.

If you have additional ideas for standing topics or programming that you would like to see included in AGRO, please contact one of the division officers.

AGRO Program Committee

Joseph Massey, 2006 – 2010 Long Range Program Coordinator		jmassey@pss.msstate.edu	
Division & Subdivision Officers			
Kevin Armbrust	Division Chair	armbrust@mscl.msstate.edu	
Ellen Arthur	Program Chair	ellen.arthur@bayercropscience.com	
Ken Racke	Vice Chair	kracke@dow.com	
Bill Hall	Chair, FERT Subdivision	bill.hall@mosaicco.com	
Terry Spittler	Treasurer	tds2@cornell.edu	
Liliana Schwartz	Secretary	liliana.schwartz@usa.dupont.com	
John Johnston	Immediate Past Chair	john.johnston@fsis.usda.gov	
Barry Cross	Councilor	barry.cross@worldnet.att.net	
Standing Members			
Jim Seiber	Awards Committee Chair	jnseiber@ucdavis.edu	
Allan Felsot	New Investigator Award Chair	afelsot@tricity.wsu.edu	
John Johnston	Education Award Committee Chair	john.johnston@fsis.usda.gov	
John Clark	Special Conferences Chair	jclark@vasci.umass.edu	
Cathleen Hapeman	Communications Committee Chair	cathleen.hapeman@ars.usda.gov	
Jason Sandahl	International Outreach Chair	jason.sandahl@fas.usda.gov	
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Ken Racke	kracke@dow.com		
Volunteer Members			
Laura McConnell	laura.mcconnell@ars.usda.gov	Steven A. Ripp	saripp@utk.edu

Planned AGRO Programming & Outreach Activities 2009 – 2011

Activity/Event	Leader(s)	Status	Actions Required
238th ACS National Meeting August 16-20, 2009 Washington, DC	Ellen Arthur		• Decide in 2009 if AGRO is returning to 2 national meetings per year
3rd International Workshop on Crop Protection Chemistry in Latin America: Environment, Safety and Regulation November 9-12, 2009 Rio de Janeiro, Brazil	Laura McConnell Ken Racke Irene Baptista de Alleluia	• Organization of speakers and meeting underway	• Visit website for more information • Call for posters • **Deadline is Aug. 30, 2009** www.iupacrio2009.org
Activities beyond 2009			
239th ACS National Meeting March 21-25, 2010 San Francisco, California	Ken Racke	• Call for Symposia & Papers this PICOGRAM (see pages 33 – 50)	• Submit papers now oasys.acs.org • **Deadline is Nov. 2, 2009**
IUPAC Pesticide Congress Summer 2010 Melbourne, Australia	Don Wauchope Hisashi Miyagawa	• Program development underway • Many AGRO members are serving on technical program committees	• Visit website for more information www.iupacicpc2010.org
Pacifichem 2010 Honolulu, Hawaii December 15- 20, 2010	John Johnston	• Two symposia will be sponsored by AGRO	• Visit website for more information www.pacifichem.org
241st ACS National Meeting March 27-31, 2011 Anaheim, California	2010 Vice Chair		
242nd ACS National Meeting August 28-September 1, 2011 Denver, Colorado	2010 Vice Chair		

Standing Program Topics

- Environmental Fate, Transport, Risk Assessment and Modeling of Agriculturally-Related Chemicals
- Technological Advances and Applications in Agricultural Science: Nanotechnology, Genetically Modified Organisms, and Biocontrol Agents
- Development of Value-Added Products from Agricultural Crops and Byproducts
- Bioenergy and Biofuels from Agriculture
- Natural Products, Pheromones, and Chemical Signaling in Agriculture
- Synthesis of Bioactive Compounds
- Human and Animal Health Protection: Veterinary Pharmaceuticals, Antimicrobials, Worker Protection Products
- Advances in Agrochemical Residue and Metabolism Chemistry
- Urban Agriculture – Turf, Ornamentals, Household Products, and Water Re-Use
- Developments in Integrated Pest Management and Resistance Management
- Soil and Nutrient Management for Sustainable Agriculture
- Agrochemical Toxicology and Mode of Action
- Residue and Metabolism Chemistry

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Future ACS National Meetings

239th ACS National Meeting & Exposition
March 21-25, 2010, San Francisco, CA

240th ACS National Meeting & Exposition
August 22-26, 2010, Boston, MA

241st ACS National Meeting & Exposition
March 27-31, 2011, Anaheim, CA

242nd ACS National Meeting & Exposition
August 28-September 1, 2011, Denver, CO

243rd ACS National Meeting & Exposition
March 25-29, 2012, San Diego, CA

244th ACS National Meeting & Exposition
September 9-13, 2012, New York, NY

245th ACS National Meeting & Exposition
April 7-11, 2013, New Orleans, LA

246th ACS National Meeting & Exposition
September 8-12, 2013, Indianapolis, IN

247th ACS National Meeting & Exposition
March 16-20, 2014, Washington, DC

248th ACS National Meeting & Exposition
August 24-28, 2014, San Francisco, CA

249th ACS National Meeting & Exposition
March 22-26, 2015, Denver, CO

250th ACS National Meeting & Exposition
August 16 - 20, 2015, Boston, MA

251st ACS National Meeting & Exposition
March 13 - 17, 2016, San Diego, CA

252nd ACS National Meeting & Exposition
August 21 - 25, 2016, Philadelphia, PA

253rd ACS National Meeting & Exposition
April 2 - 6, 2017, San Francisco, CA

254th ACS National Meeting & Exposition
September 10 - 14, 2017, St. Louis, MO

You Are Cordially Invited To:

AGRO Brainstorming, Blues & Brews

Happy Hour

Wednesday, August 19, 5:00 – 7:00 pm
Renaissance Washington -- Grand Ballroom South

- **Share your ideas about the future AGRO programming**
- **Learn more about organizing a symposium**
- **Let us know what topics are the most important to you**

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Contact: Dr. Eric Lorenz
573-777-6051
www.abclabs.com

Morse Laboratories, LLC
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Contact: Gary Westberg
916-481-3141
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ABC Laboratories

Symposia Announcements & Call for Papers

239th ACS National Meeting & Exposition

March 21-25, 2010, San Francisco, CA

ACS Theme: Chemistry for a Sustainable World

AGRO is planning an exciting and diverse technical program in San Francisco, CA at the 2010 Spring National Meeting. A listing of both award and general symposia in the works for San Francisco appears below and on the following page. Please consider how you may participate by contributing an oral lecture or poster presentation. You may contact one of the symposium organizers listed below if you would like to contribute to a specific session. Any further ideas or questions related to the San Francisco technical program can be directed to 2010 AGRO Program Chair Ken Racke at (317) 337-4654 or KRacke@dow.com.

Award Symposia

Strategic Molecular Designs of Neonicotinoid Insecticides - *AGRO International Award for Research in Agrochemicals to Honor Dr. Shinzo Kagabu*
Organizers: John Casida, University of California-Berkeley, 510-642-5424, ectl@nature.berkeley.edu; Motohiro Tomizawa, Gifu University, tomizawa@gifu-u.ac.jp

Sterling B. Hendricks Memorial Award Lecture
Jointly with Ag and Food Division
Organizer: James Seiber, University of California-Davis, 530-752-1465, jnseiber@ucdavis.edu

AGRO New Investigator Award
Organizer: Allan Felsot, Washington State University, 509-372-7365, afelsot@tricity.wsu.edu

AGRO Education Awards for Undergraduate and Graduate Student Travel: Research Poster Presentations
Organizer: John Johnston, USDA-FSIS, 202-365-7175, john.johnston@fsis.usda.gov

Symposia for Invited and Solicited Papers

Symposium Honoring Prof. John Casida
Organizers: John Johnston, USDA-FSIS, 202-365-7175, john.johnston@fsis.usda.gov; Luis Ruzo, PTRL-West l.ruzo@ptrlwest.com; Jim Seiber, University of California-Davis, jnseiber@ucdavis.edu

Advances in Biofuels and Bioproducts: Life Cycle Analysis and Sustainability (CELL)
Organizers: Cathleen Hapeman, USDA-ARS, 301-504-6451, cathleen.hapeman@ars.usda.gov; Joe Massey, Mississippi State University, jmassey@pss.msstate.edu; Jim Seiber, University of California–Davis jnseiber@ucdavis.edu; Liliana Schwartz, DuPont Crop Protection, liliana.schwartz@usa.dupont.com

Analytical Challenges Associated with New Pesticide Classes (ENVR)
Organizers: Kevin Armbrust, Office of the State Chemist- Mississippi, 662-325-3324, Armbrust@mscl.msstate.edu; George Cobb, Texas Tech University, george.cobb@tiehh.ttu.edu

Comparing Conventional and Biotechnology-based Pest Management
Organizers: Keri Henderson, Pioneer Hi-Bred, 515) 248-4914 keri.henderson@pioneer.com; Stephen Duke, USDA-ARS, Stephen.duke@ars.usda.gov; Will Ridley, Monsanto Company, william.p.ridley@monsanto.com; Nick Storer, Dow AgroSciences, nstorer@dow.com

Efficient Application of Pesticides for Sustainable and Effective Crop Protection
Organizers: Erdal Ozkan, Ohio State University, 614-292-2006, ozkan.2@osu.edu; Al Barefoot, DuPont Crop Protection, aldous.c.barefoot@usa.dupont.com; Carol Ramsay, Washington State University ramsay@wsu.edu

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- **Study Monitoring**

JRF America, USA

- **Metabolism and Environmental Fate (Plant, Soil, Mammalian Species, Aquatic Photolysis and Hydrolysis**
- **Trace Analysis and Crop Residue Studies**
- **Field and Aquatic Dissipation**
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Fax : (+1) 610 878 6475
E-mail : rodney.bennett@jrfamerica.com
Website: www.jrfamerica.com

Symposia Announcements & Call for Papers (con't)

239th ACS National Meeting & Exposition

March 21-25, 2010, San Francisco, CA

Emerging Contaminants in California's Coastal and Estuarine Ecosystems
Organizers: Kevin Armbrust, Office of the State Chemist-Mississippi, 662-325-3324, armbrust@mscl.msstate.edu; Michelle Hladik, U.S. Geological Survey, mhladik@usgs.gov; Keith Maruya, Southern California Coastal Water Research Project, Keithm@sccwrp.org; Meg Sedlak, San Francisco Estuary Institute meg@sfei.org; Patricia Rice, BASF Corporation, patricia.rice@basf.com

Invasive Species: Is Chemistry up to the Task?
Organizers: Tracy Ellis, County of San Diego, 858) 694-3897, tracy.ellis@sdcounty.ca.gov; Susan O'Toole, USDA-APHIS sotoole@aphis.usda.gov; Kenneth Racke, Dow AgroSciences, kracke@dow.com; Ellen Arthur, Bayer CropScience, ellen.arthur@bayercropscience.com

Pesticide Mitigation Strategies for Surface Water Quality
Organizers: Brian Bret, Dow AgroSciences, 916-780-7477, BLbret@dow.com; Tom Potter, USDA-ARS, tom.potter@ars.usda.gov; Nick Poletika, Dow AgroSciences, npoletika@dow.com

Pesticides and Urban Water Quality: Monitoring, Modeling and Mitigation
Jay Gan, University of California-Riverside, 951-827-2712, jgan@ucr.edu; Frank Spurlock, California Department of Pesticide Regulation, fcspurlock@cdpr.ca.gov; Paul Hendley, Syngenta Crop Protection Inc., paul.hendley@syngenta.com

Pesticides in Urban Settings and Aggregate Human Exposures
Daniel M. Stout II, U.S. EPA, 919-541-5767 stout.dan@epa.gov; Bob Krieger, University of California-Riverside, Bob.Krieger@ucr.edu; Chris Peterson, USDA-USFS, cjpeterson@fs.fed.us

The Push for Greener Formulations: Evolving Regulatory Frameworks for Inerts and Co-formulants
Organizers: Cheryl Cleveland, Dow AgroSciences, 317-337-3532, cbcleveland@dow.com; PV Shah, US EPA, Shah.Pv@epamail.epa.gov, Jim Yowell, Huntsman, jim_yowell@huntsman.com

Third Agrochemical Symposium on Modern Chiral Pesticides: Enantioselectivity and its Consequences
Organizers: Wayne Garrison, U.S. EPA, 706-355-8219 garrison.wayne@epa.gov; Jay Gan, University of California-Riverside jgan@ucr.edu

Understanding Greenhouse Gases from Agriculture
Organizers: Amrith Gunasekara, CDFA, 916-445-0444, agunasekara@cdfa.ca.gov; Laura McConnell, USDA-ARS, Laura.McConnell@ars.usda.gov; Lei Guo, CARB, Lguo@arb.ca.gov; Sarah Pittiglio, CEC, spittigl@energy.state.ca.us

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Watch for new announcements at our website –

www.agrodiv.org

- AGRO activities and events details
- PICOGRAMs and Femtograms
- Links to interesting meetings
- Call for Papers
- How to join AGRO
- Award Nomination Forms
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Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

AGRO International Award for Research in Agrochemicals

Symposium to Honor Dr. Shinzo Kagabu for his Research Contributions Related to Neonicotinoid Insecticides

Strategic Molecular Designs of Neonicotinoid Insecticides

Purpose of Symposium

Neonicotinoid insecticides are extensively used throughout the world for crop protection and animal health care. They account for more than one-fifth of the total insecticide market. This symposium on "**Strategic Molecular Designs"** focuses on the chemistry of the insecticidal nicotinic agonists and the chemical biology of the target nicotinic acetylcholine receptors. The aim is to provide fascinating and versatile topics stimulating discovery: i.e., chemorational approaches including physicochemical considerations and metabolic activation and detoxification; chemical biology aspects potentially facilitating receptor structure-guided insecticide design. The ultimate goal is continued safety with enhanced effectiveness including against resistant pests.

Invited Lectures

- Discovery of neonicotinoid insecticides - discovery of imidacloprid/thiacloprid and exploring novel compounds - global strategy and status for neonicotinoids
- Physicochemistry, metabolism, and resistance of neonicotinoids - importance of physicochemical properties - neonicotinoid metabolism in insects and mammals – mechanism of neonicotinoid resistance
- Neonicotinoid chemistry - clothianidin, dinotefuran, and announcements of new nicotinic compounds
- Nicotinic receptor and ligand design - chemical neurobiology of the nicotinic receptor-AChBP as a model for nicotinic structure and pharmacology-structure of insect nicotinic receptor -receptor structure-guided neonicotinoid design

Call for participants for the accompanying poster session including general aspects of insecticide science

***For further information contact the organizers*:**

Dr. John E. Casida, University of California-Berkeley, e-mail: ectl@nature.berkeley.edu
Dr. Motohiro Tomizawa, Gifu University, Japan, e-mail: tomizawa@gifu-u.ac.jp

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Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

Symposium and Celebration in Honor of Professor John Casida

Celebrating Contributions to the Chemistry, Metabolism and Mode of Action of Agrochemicals by Professor Casida, his Alumni and Colleagues and Professor Casida's 80th Birthday

Purpose of Symposium

Alumni, colleagues, and friends of Professor John Casida are invited to participate in a symposium and associated celebrations honoring the accomplishments of Professor John Casida. From 1951 – present, Professor Casida, his alumni and colleagues have contributed an enormous body of knowledge to the study of the chemical and metabolic fate of agrochemicals, including activation and detoxification processes, and their mode of action. This work continues to provide essential tools for determining the commercial viability and potential impact of pesticides on public health and the environment.

This symposium will highlight the original work conducted at the Berkeley and Madison laboratories with a great variety of chemical classes including the chlorinated hydrocarbons, organophosphates, methylcarbamates, pyrethroids, ryanoids, neonicotinoids and others, coupled with the current status of these products in crop protection applications.

Planned Topics

- Metabolism, activation/detoxification mechanisms and chemical models
- Mode of action and primary targets, in reference to receptors, enzymes and ion channels
- Secondary toxicological targets
- Structure optimization Use of byproduct streams to generate biofuels and energy

***For further information contact the organizer*:**

John Johnston, USDA-FSIS, (202) 365-7175, John.Johnston@fsis.usda.gov
Luis Ruzo, PTRL West, (510) 741-3000 x228, l.ruzo@ptrlwest.com
Jim Seiber, University of California-Davis, (530) 752-1465, jnseiber@ucdavis.edu

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Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

Advances in Biofuels and Bioproducts: Life Cycle Analysis and Sustainability

Purpose of Symposium

Production and use of biofuels and bioproducts will play an important role in gaining independence from foreign oil and may also decrease greenhouse gas production. However, energy is required to produce the raw material and to process and to convert the materials to useable products. Transportation of the processed materials also requires energy. Life Cycle Analysis (LCA) tools are needed to determine whether the use biofuels and their production have net positive or negative environmental effects. In addition, the changes in land use could have broad long term effects on the environment as fallow fields and conservation reserves are converted to agricultural crops. The conversion of food crop lands to biofuel production also raises concerns.

Suggested Topics

- Environmental concerns associated with biofuel production – raw material production and post harvest – e.g., soil loss through erosion, greenhouse gas emissions, water quality and air quality
- Agronomic practices that address environmental concerns of biofuel production
- Model development for LCA
- Quantifying inputs for LCA models
- Quantifying positive and negative economic effects of biofuel production and use
- Changes in air quality associated with the use of biofuel versus petroleum based fuels
- Effects of land use changes associated with biofuel production
- Quantifying conversion of conservation reserve land to biofuel production
- Development of processes that address byproduct production from harvesting and conversion of crops
- Use of byproduct streams to generate biofuels and energy

***For further information contact the organizers*:**

Cathleen Hapeman, USDA-ARS, 301-504-6451, cathleen.hapeman@ars.usda.gov
Joe Massey, Mississippi State University, 662-325-4725, jmassey@pss.msstate.edu
James Seiber, University of California – Davis, 530-752-1465, jnseiber@ucdavis.edu
Liliana Schwartz, DuPont Crop Protection, 302-999-4078, liliana.schwartz@usa.dupont.com

Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

Analytical Challenges for New Crop Protection Products
Co-Sponsored by ENVR

Purpose of Symposium

Recent developments in biochemistry and genetics have allowed far superior targeting of crop protection chemicals to control pest species. These improvements allow chemical application rates to be reduced significantly. Furthermore, gene insertion into crops allows plants to produce natural toxins that repel or kill pests. Nevertheless, concerns regarding impacts on non-target must be addressed. Such evaluations require toxicity testing in several species and dissipation studies in several media. Human exposures and allergic responses have emerged with the advent of crops that fall into the category of genetically modified organisms (GMOs).

Analytical challenges are significant when addressing exposure to new crop protection chemicals. Improvements in detection limits and analysis of transformation products are required to quantify new synthetic pesticides adequately. Techniques to isolate and quantify toxins from GMOs also require more efficient and precise methods.

This symposium will address:

- Improvements in quantification of newly formulated/incorporated crop protection chemicals that have been afforded by better preparatory processes and instrumental capabilities.
- Study designs
- Specialized SPE sorbents
- Preparative HPLC
- Improved mass spectrometer detection
- Improved data processing

***For further information contact the organizers*:**

George P. Cobb, Texas Tech University, george.cobb@tiehh.ttu.edu
Kevin Armbrust, Office of State Chemist, Mississippi, armbrust@mscl.msstate.edu

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Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

Comparing Conventional and Biotechnology-Based Pest Management

Purpose of Symposium

While the conventional pesticide world has had several decades to evolve harmonized regulatory approaches, agricultural biotechnology has had much less time to develop similar strategies and regulatory expectations. The purpose of this symposium is to compare and contrast approaches for environmental risk assessment, IPM, resistance management, and discovery for conventional pesticides compared to transgenic crops.

Suggested Topics

- Environmental risk assessment approaches
- Integrated pest management practices
- Mode of action
- Discovery research and future products
- Insect and weed resistance management approaches
- Cost-benefit analyses
- Integration of biotechnology with conventional pesticides
- Adventitous transgenes and food identity preservation

***For further information contact the organizers*:**

Keri Henderson, Pioneer Hi-Bred, 515-248-4914, keri.henderson@pioneer.com
Stephen Duke, USDA-ARS, Stephen.duke@ars.usda.gov
Will Ridley, Monsanto Company, william.p.ridley@monsanto.com
Nick Storer, Dow AgroSciences, nstorer@dow.com

Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

Efficient Application of Pesticides for Sustainable and Effective Crop Protection

Purpose of Symposium

This symposium will focus on current and future technologies for efficient pesticide application. Some of the questions that will be emphasized include:

- How efficiently are pesticide products being applied with today's technology and what are the major problem areas for solutions?
- What are the newer technologies that may improve application efficiency and safety, while reducing spray drift?
- How well are pesticide label language, stewardship web sites and current training programs addressing an understanding by applicators on application efficiency? What improvements are required?
- What developments of interest from other regions can we learn from in the U.S.?

Suggested Topics

- Drop size for efficacy balanced with drop size for drift mitigation
- Use of new technology (using GPS/GIS for site specific application; sensors; automation etc. to reduce pesticide consumption)
- Drift reduction technology
- Reducing pesticide deposits on the soil
- Reducing potential for ground and surface water contamination
- Application use directions on pesticide labeling (paper or web-distributed labeling)
- Effective training of pesticide applicators for efficient and safe application of pesticides
- Enforcement issues with EPA Draft PRN for spray drift

***For further information contact the organizers*:**

Erdal Ozkan, Ohio State University, 614-292-2006, email: ozkan.2@osu.edu
Al Barefoot, DuPont Crop Protection, email: aldous.c.barefoot@usa.dupont.com
Carol Ramsay, Washington State University, email: ramsay@wsu.edu

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Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

Emerging Contaminants in California's Coastal and Estuarine Ecosystems

Purpose of Symposium

California's coastal and estuarine waterways are the ultimate terminus for chemicals transported in rivers, storm water runoff, and treated wastewater effluents. Potential sources of these anthropogenic chemicals include uses in agriculture, pharmaceutical, industrial, urban, and suburban settings as well as those present in regulated discharges and recycled water. While legacy chemicals are commonly detected in monitoring programs, of special interest are those that are not routinely measured and are of emerging concern. This symposium intends to explore the sources, occurrence, fate, and impact of these chemicals in the state's coastal marine and estuarine ecosystems which includes water, sediment, and biota.

Suggested Topics

- Transport and occurrence of emerging contaminants in water, sediment and biota
- Degradation and fate in seawater or marine sediment
- Toxicity and exposure to marine and estuarine organisms
- Level and frequency of measured residues and associated relevance to aquatic community status
- Novel monitoring tools and frameworks
- Transformation and persistence
- Mitigation of chemical loads
- Regulations and policy
- Prioritization for regulatory action and research needs

***For further information contact the organizers*:**

Kevin Armbrust, Office of the State Chemist-Mississippi, armbrust@mscl.msstate.edu
Michelle Hladik, U.S. Geological Survey, mhladik@usgs.gov
Keith Maruya, Southern California Coastal Water Research Project (SCCWRP), Keithm@sccwrp.org
Meg Sedlak, San Francisco Estuary Institute (SFEI), meg@sfei.org
Patricia Rice, BASF Corporation, patricia.rice@basf.com

Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

Invasive Pests: Is Chemistry up to the Task?

Purpose of Symposium

The purpose of the symposia is to review the successes and failures in the ongoing battle against invasive pests in agriculture over the past 15 years and ask ourselves if we are chemically prepared for the future. Exclusion, early detection and eradication of successful programs have relied upon strong foundations of chemical knowledge. Control failures in these areas are usually attributed to lack of chemical information on the invasive species. If invasive pests become established, management programs rely heavily on control chemistries such as herbicides, rodenticides, and insecticides, however many programs may suffer a lack of options in the future. This symposium will try to raise awareness and focus on where the most needed chemical research should be conducted against this wide and ever-burgeoning array of invasive pests.

Suggested Topics

- U.S. agriculture has had successes and failures-- certain knowledge and technologies make eradication and management programs successful. May we predict which invasive pests can be successfully eradicated and those which must be immediately shifted to pest management, thereby being resource efficient?
- How does US agriculture stay informed to assess and rank the threat of emerging pests to maintain priorities?
- What are the uses for cost-benefit analysis of federal and federal insect eradication programs?
- What might be the resources or technology we are not using effectively—can we do better with what we already have?
- Implementation of an eradication program of an invasive typically requires a rapid response by a governmental agency:
  - What are examples of how public perceptions (good and bad) influenced the success or failure of control programs?
  - How may pesticide approval processes improve to engender public trust?
  - What are the regulatory issues that slow down the response to invasive pests, and what might be done to anticipate and remove regulatory barriers?
- What are the most relied-upon chemistries in the management of invasive pests in the past 15 years and which are likely to be relied upon in the future?
- What are the anticipated chemical knowledge needs against invasive pests in current and future battles?

Invasive examples for symposia discussion are invertebrate pests, plant, fish, or livestock pathogens, & vertebrate pests, such as Asian citrus psyllid, wheat stem rust, salmon anemia, and Gambian pouch rat.

***For further information contact the organizers*:**
Tracy Ellis, County of San Diego, 858-694-3897, tracy.ellis@sdcounty.ca.gov
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Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

Pesticide Mitigation Strategies for Surface Water Quality

Purpose of Symposium

The purpose of this symposium is to bring together stakeholders from across the country to discuss latest research on mitigation measures to protect surface water quality from pesticides. Experts will address not just latest research results but also the challenges and opportunities in getting adoption and implementation of mitigation measures.

Suggested Topics

- Science-based implementation and assessments of mitigation measures.
- Advances in modeling research to predict runoff and assess effectiveness of mitigation measures.
- Conservation tillage, vegetation, and biofilters for reducing pesticide runoff.
- Use of polyacrylamide, enzymes, and other treatments to reduce pesticides in agricultural waters.
- Use of irrigation strategies to increase infiltration and reduce runoff
- Obtaining adoption from agricultural community.

***For further information contact the organizers*:**

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Tom Potter, USDA/ARS, email: tom.potter@ars.usda.gov phone: 229-386-7073
Nick Poletika, Dow AgroSciences, email npoletika@dow.com, phone: 317-337-3476

Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
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Pesticides and Urban Water Quality: Monitoring, Modeling and Mitigation

Purpose of Symposium

Over the last few years, monitoring, research and regulatory activities addressing the issue of urban pesticide use and water quality has significantly increased. Urban-use pesticides that have attracted a great deal of attention include synthetic pyrethroids and other insecticides, as well as some fungicides and herbicides. This symposium will highlight recent advances in source identification, sampling and analytical methodology, transport mechanisms, fate and transport modeling, ecological risk assessment, and evaluation of mitigation practices.

Suggested Topics

- Urban pesticide use patterns and trends
- Monitoring and source identification
- Sampling and analysis
- Runoff monitoring and modeling
- Transport processes
- Transformation and persistence
- Aquatic toxicity
- Mitigation measures
- Regulatory opportunities and challenges

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Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

Pesticides in Urban Settings and Aggregate Human Exposures

Purpose of Symposium

Pesticides are applied in the urban environment to control a variety of pests that compete directly for resources or that impact human health. Pesticide applications are made to yards and gardens, public parks and schools, golf courses, and in homes, restaurants, and other businesses. Target pests include rodents, weeds, insects, fungi and pathogens. Pesticide applications can result in toxic residues in close association with the activities of humans thereby increasing the potential for exposures. The reliance on chemical control procedures has created a large chemical industry that is dedicated to producing specialty pest control products. These products are marketed not only to professional users, but also directly to consumers. Since pest control products are inherently toxic they are regulated at both the federal and state levels, and are monitored by numerous interest groups. Research is conducted by universities and others to explore the nature of the target pests and to develop safer, more efficient methods to control pests. This symposium will bring together interested individuals to discuss and to highlight research topics associated with pest control in the urban environment.

Suggested Topics

- Fate and transport of pesticides in the urban environment.
- New and emerging pesticides and formulations.
- Risk assessments for urban pesticides.
- Results of surveys and regional measurement studies.
- Advances in integrated pest management (IPM).
- New and emerging pests and their chemical control.
- The influence of federal regulation.
- Advances in sampling and analytical techniques for pesticide residues.
- Advances in understanding urban pest biology and ecology for more efficient control.
- Emerging urban pests and their control.

***For further information contact the organizers*:**

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Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

The Push for Greener Formulations: Evolving Regulatory Frameworks for Inerts and Co-formulants

Purpose of Symposium

Inert chemicals are key components of pesticide formulations known as co-formulants which have historically been regulated separately and differently than the active ingredient components. Increasing regulation and data requirements are evolving due to US EPA FQPA inerts revaluation program, EU REACH program, and PMRA and Health Canada. Increased emphasis on screening level studies and methodology based on QSAR clustering and read across principles have been employed and new risk assessment procedures are evolving as well. In response, a move to greener formulations and new technologies is evidenced in world wide regulation, manufacturer's research programs and public demand.

Suggested Topics

- Emerging Data Requirements and Risk Assessment Methodology for Co-formulants and Inerts
- EPA Inerts Evaluation Process under FQPA
- EU Reach Implications for Agrochemicals
- TSCA and US ChAMP Program
- Industry Challenges and Solutions to New Regulations
- US Joint Inerts Task Force Experiences
- Greener formulations, new technologies and product sustainability goals
- VOCs monitoring, science models and policies
- Reactivity
- GHS - impact on pesticide formulations

***For further information contact the organizers*:**

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Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

Third Agrochemical Symposium on Modern Chiral Pesticides: Enantioselectivity and Its Consequences

Purpose of Symposium

Many current pesticides are chiral and exist as two (or more) enantiomers. Enantiomers often exhibit significant differences in biological activity towards both target and non-target species, as well as different transformation rates. To achieve the best possible level of environmental and human health protection while also maintaining the desired crop protection benefits, the agrochemical industry has introduced a number of single- or enriched-enantiomer pesticide products. The goal of this symposium is the presentation and discussion of research on the environmental impact, transformation, metabolism and toxicity of modern chiral pesticides, including the existing single- or enriched-enantiomer products. Presentation on the development, benefits, economic drivers and regulatory factors governing the production and use of single- or enriched-enantiomer pesticides are also encouraged.

Suggested Topics

- Methods for preparatory separation of the enantiomers of racemic pesticides
- Methods for analysis of pesticide enantiomers in environmental and human samples
- Occurrences of pesticide enantiomers in humans and the environment
- Microbial transformation of chiral pesticides
- Enantioselective effects of chiral pesticides on target and non-target species
- Economic factors relating to the manufacture and use of single- or enriched-enantiomer pesticides
- Regulatory assessment of single- and enriched-enantiomer pesticide products
- Production and use of single- or enriched-enantiomer pesticides as a green chemistry measure

***For further information contact the organizers*:**

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Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

Symposium Outline & Call for Papers
239th ACS National Meeting & Exposition
March 21–25, 2010
San Francisco, California

Understanding Greenhouse Gases from Agriculture

Purpose of Symposium

Greenhouse gas emissions have become a serious concern given the many implications of global warming. The knowledge base on greenhouse gas emissions from agriculture is limited. Understanding the baseline levels, contributing factors, and complex episodic cycles that drive some of the processes are critical to finding practical solutions for formulating mitigation measures. State entities have taken a leading role on this issue by providing regulatory authority to address greenhouse gases, but actions are still pending because further research is needed. For instance, California's Assembly Bill 32 seeks to address greenhouse gas levels in the state including nitrous oxide emissions from nitrogen fertilizer use in agriculture. This symposium seeks to bring together scientists interested in greenhouse gases from agriculture to share research findings and potential control technologies. The sessions are expected to lead to interactions at the national and international level among scientists and contribute to the knowledge base of greenhouse gas emissions from agriculture.

Suggested Topics

- Quantifying baseline greenhouse gas levels from crop systems
- Nitrous oxide emissions from nitrogen fertilizer use
- Examining the contributions of soil and water to greenhouse gas emission levels
- Modeling of greenhouse gases from agriculture systems
- Agronomic practices that mitigate greenhouse gases from agriculture
- Greenhouse gas level reductions from land use changes/practices
- Novel analytical techniques to measure greenhouse gases from agriculture
- New technologies that can reduce greenhouse gas emissions from agriculture
- Understanding incomplete nutrient cycling and their contribution to greenhouse gas emissions
- Carbon sequestration through agricultural cultivation to reduce greenhouse gas emissions
- Policy issues and linkage to emerging carbon credit markets
- Nitrous oxide and methane emissions from agricultural soils amended with biochar

***For further information contact the organizers*:**

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Sarah Pittiglio, CEC, 916-654-3962, spittigl@energy.state.ca.us

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Abstracts (150 words or less) must be submitted on-line at oasys.acs.org ***by Nov 2, 2009***

12th IUPAC International Congress of Pesticide Chemistry

www.iupacicpc2010.org

4-8 July 2010
Melbourne Exhibition and Convention Centre
Melbourne, Australia

Conference Themes include:

- *Pest Management and Crop Protection*— chemical ecology, crop protection in the GM crop era, natural products, biopesticides, mode of action & metabolism, discovery of new pesticides, resistance management
- *Emerging Issues for Industry* — global warming, drought tolerant crops, biofuels, GM crops
- *Regulatory and Residue*— international harmonization for determining maximum residue limits (MRLs) for pesticides; examination of CODEX; interaction of politics and science of risk assessment
- *Formulation and Delivery*— current and future trends in formulation; delivery of biopesticides and natural products; pesticide quality; application technology; uptake and translocation
- *Environmental Fate and Safety Assessment*—pesticide risk assessment and mitigation; endangered species; evaluation of best management practices; advances in simulation of pesticide fate and transport; using GIS tools and remote sensing; pesticide use in developing countries

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Melbourne — the second largest city in Australia and home to eight universities and many research institutes

3rd International Workshop on Crop Protection Chemistry in Latin America: Environment, Safety, and Regulation

9-12 November, 2009
Rio de Janeiro, Brazil

CALL for POSTER ABSTRACTS
Deadline August 30

www.iupacrio2009.org

Technical Program

The workshop will include a plenary program with simultaneous translation from English to Portuguese and Spanish. All attendees are encouraged to present a poster of their work to be displayed throughout the workshop. Eight over-arching topics will be included:

Monday November 9

Opening Ceremony

Strengths and weaknesses of Brazilian Agricultural Markets – Roberto Rodregues, Former Agriculture Minister of Brazil

Tuesday November 10

Innovative Chemistry and Technology for Crop Protection

- Benefits and risks of pesticides in the global perspective - Gerald R. Stephenson – Univ. Guelph, Canada
- New developments in biotechnology for crop protection - Maria de Fátima Grossi de Sá – Embrapa Recursos Genéticos, Brazil
- Development of advanced formulations – Holger Tank – Dow AgroSciences, USA
- Chemical control of aquatic Plants – Edivaldo Domingues Velini – UNESP Botucatu, Brazil
- Global agricultural markets – Harald von Witzke – Humboldt Unv., Germany
- The importance of new active principle for agricultural sustainability – Laércio Zambolim – UFV, Brazil

Risk Assessment, Regulation and Global Harmonization

- Importance of risk assessment in the regulatory decision-making process – Keith R. Solomon – Univ. Guelph, Canada
- Risk assessment of pesticides and GLP program from INMETRO/Brazil - Elisa Rosa dos Santos, INMETRO, Brazil
- Joint evaluations and global regulatory cooperation – Jeff Herndon, US EPA, USA
- Residue guidelines OECD program harmonization with US EPA – Volker Bornemman, BASF, USA
- Role of international treaties, conventions (POPs, PIC) – Bernhard Johnen, CropLife International, Belgium

Rio de Janiero

Beaches of Ipanema

Wednesday November 11

Pesticide Residues in Food and Human Exposure

- International approaches to evaluation of residues in food – Caroline Harris, Exponent, UK
- Brazil approach to assessment of dietary risk – Eloisa Dutra Caldas, UnB, Brazil
- Design and implementation of global residue programs – Carmen Tiu, Dow AgroChemical, USA
- Residues in food, trade, MRL harmonization, import tolerances – Phil Brindle, BASF, USA
- Pesticide residue monitoring program – Ricardo Velloso, ANVISA Brazil
- Biodegradation of chemical pesticides as a strategy for residue treatment: experiences in Mexico – Maria Laura Ortiz Hernández, CEIB/UAEM, Mexico
- Advances in analysis of pesticide residues in food – Adélia Cristina Pessoa Araújo, ITEP, Brazil
- Issues related to minor crops and residues in food – Luiz Eduardo Pacifici Rangel, MAPA, Brazil
- Resolving trade issues for pesticide residues – Rogério Pereira da Silva, SRI, MAPA, Brazil
- Conducting total diet surveys for pesticide exposure – Sue-Sun Wong, Consultant, Taiwan

Thursday November 12

Environmental Chemistry and Risk Assessment

- Experience of Crop Life in the implementation of environmental risk assessment tools in Latin America – Joe Dulka, DuPont, USA
- Role of modeling in environmental risk assessment – Jan Linders, RIVM, Netherlands
- Pesticide volatility and atmospheric transport – Laura McConnell, USDA-ARS, USA
- E-valuate: pesticide ecorisk assessment and training module – Ron Parker, US EPA, USA
- Case study of environmental risk assessment approach – Keith Solomon, Univ. Guelph, Canada
- Pesticide environmental assessment approaches – Rafaela Maciel Rebelo, IBAMA, Brazil
- Toxicological effects of agrochemicals – Francisco José Roma Paumgartten, Fiocruz, Brazil

Education and Stewardship in Protection

- Accelerating capacity building in Latin America and networking analytical laboratories – Ian Ferris, FAO/IAEA, Austria
- Global agrochemical information sources – John Unsworth, Consultant, UK
- E-learning and analytical laboratories – Elizabeth Carazo, Univ. Costa Rica, Costa Rica
- Education and regulation in pesticide application – Luís Cesar Pio/Herbicat, Brazil
- Actionas of chemical industry for stewardship including product quality – José Otavio Menten, ANDEF, Brazil
- Recalling and processing of empty pesticide containers - João Cezar Rando, InpEV, Brazil
- Evolution of PPEs in Brazil, Hamilton Umberto Ramos, IAC, Brazil

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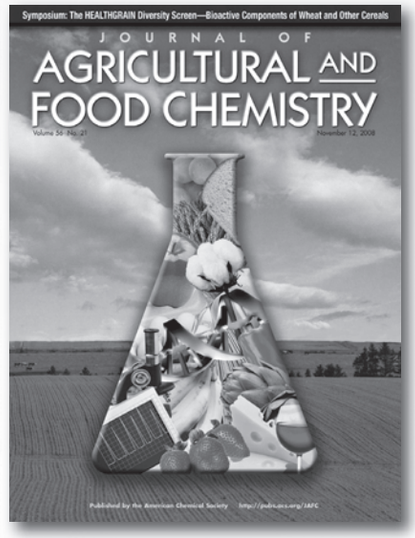


Journal of Agricultural and Food Chemistry: Healthgrains Special Issue

Volume 56, Issue 21

Highlighted by the contributions from Peter Shewry and an international group of researchers, the papers in this special issue illustrate the wide scope with which the *Journal of Agricultural and Food Chemistry* helps its global audience to understand significant advances and research in the chemistry and biochemistry of agriculture and food as it affects the world we live in.

http://pubs.acs.org/jafc
2007 Total Citations: 45,286
2007 ISI Impact Factor: 2.532

150 bread wheat lines and 50 other lines of small-grain cereals were cultivated, harvested, milled, and analyzed in the Healthgram Program for a range of phytochemicals and fiber components that are considered to have health benefits. Detailed analysis was subsequently performed showing lines wherein high levels of phytochemicals and dietary fiber components originate and are combined with good yield and processing quality that would allow plant breeders to produce commercially competitive lines with high levels of bioactive components.

Articles:

The HEALTHGRAIN Cereal Diversity Screen: Concept, Results, and Prospects
Ward, Jane L., Poutanen, Kaisa, Gebruers, Kurt, Piironen, Vieno, Lampi, Anna-Maija, Nyström, Laura, Anderson, Annica A. M., , Per Åman, Boros, Danuta, Rakszegi, Mariann, Bedő, Zoltan, and Shewry, Peter R.

Composition and End-Use Quality of 150 Wheat Lines Selected for the HEALTHGRAIN Diversity Screen
Rakszegi, Mariann, Boros, Danuta, Kuti, Csaba, Láng, László, Bedő, Zoltán, and Shewry, Peter R.

Variation in the Content of Dietary Fiber and Components Thereof in Wheats in the HEALTHGRAIN Diversity Screen
Gebruers, Kurt, Dornez, Emmie, Boros, Danuta, , Anna Fraś, Dynkowska, Wioletta, Bedő, Zoltan, Rakszegi, Mariann, Delcour, Jan A., and Courtin, Christophe M.

Phytochemicals and Dietary Fiber Components in Rye Varieties in the HEALTHGRAIN Diversity Screen
Nyström, Laura, Lampi, Anna-Maija, Andersson, Annica A. M., Kamal-Eldin, Afaf, Gebruers, Kurt, Courtin, Christophe M., Delcour, Jan A., Li, Li, Ward, Jane L., Fraś, Anna, Boros, Danuta, Rakszegi, Mariann, Bedő, Zoltan, Shewry, Peter R., and Piironen, Vieno

Folate in Wheat Genotypes in the HEALTHGRAIN Diversity Screen
Piironen, Vieno, Edelmann, Minnamari, Kariluoto, Susanna, and Bedő, Zoltan

Phytosterols in Wheat Genotypes in the HEALTHGRAIN Diversity Screen
Nurmi, Tanja, Nyström, Laura, Edelmann, Minnamari, Lampi, Anna-Maija, and Piironen, Vieno

Phenolic Acids in Wheat Varieties in the HEALTHGRAIN Diversity Screen
Li, Li, Shewry, Peter R., and Ward, Jane L.

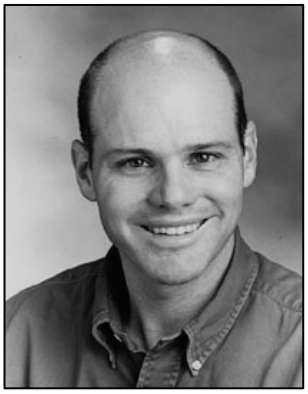
Tocopherols and Tocotrienols in Wheat Genotypes in the HEALTHGRAIN Diversity Screen
Lampi, Anna-Maija, Nurmi, Tanja, Ollilainen, Velimatti, and Piironen, Vieno

Alkylresorcinols in Wheat Varieties in the HEALTHGRAIN Diversity Screen
Andersson, Annica A. M., Kamal-Eldin, Afaf, Fraś, Anna, Boros, Danuta, and Åman, Per

Phytochemical and Fiber Components in Oat Varieties in the HEALTHGRAIN Diversity Screen
Shewry, Peter R., Piironen, Vieno, Lampi, Anna-Maija, Nyström, Laura, Li, Li, Rakszegi, Mariann, Fraś, Anna, Boros, Danuta, Gebruers, Kurt, Courtin, Christophe M., Delcour, Jan A., Andersson, Annica A. M., Dimberg, Lena, Bedő, Zoltan, and Ward, Jane L.

Phytochemical and Dietary Fiber Components in Barley Varieties in the HEALTHGRAIN Diversity Screen
Andersson, Annica A. M., Lampi, Anna-Maija, Nyström, Laura, Piironen, Vieno, Li, Li, Ward, Jane L., Gebruers, Kurt, Courtin, Christophe M., Delcour, Jan A., Boros, Danuta, Fraś, Anna, Dynkowska, Wioletta, Rakszegi, Mariann, Bedő, Zoltan, Shewry, Peter R., and Åman, Per

AGRO Division Officers



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See page 28

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1976	Julius J. Menn	1990	Willa Garner	2004	Rodney Bennett
1977	James P. Minyard	1991	Guy Paulson	2005	Allan Felsot
1978	Gerald G. Still	1992	Joel Coats	2006	R. Donald Wauchope
1979	S.K. Bandal	1993	Larry Ballantine	2007	Laura L. McConnell
1980	Jack R. Plimmer	1994	Nancy N. Ragsdale	2008	John J. Johnston
1981	Marguerite L. Leng	1995	Don Baker		
1982	Gino J. Marco	1996	Barry Cross		

AGRO Strategic Plan
2009 Accomplishments & 2010 Plans

MISSION

The AGRO Division promotes knowledge benefiting society through advancements in agricultural, public health, and environmental science and technologies.

VISION FOR THE FUTURE

The AGRO Division will increase its recognition as a global leader in agriculture, public health, and environmental sciences by engaging and energizing its membership to foster global interactions that provide innovative solutions to challenges facing our world.

GOAL 1

Enhance the membership experience by providing accessible and innovative programs, educational products, mentoring and career services and opportunities for professional development and recognition.

Patricia Rice— patricia.rice@basf.com; 919-547-2668
Dan Stout— stout.dan@epa.gov; 919-541-5767

Accomplishments in 2009

- ✓ Graduate Student and Post Doctoral Luncheon held in Washington DC – Presentation from AAAS Science & Technology Policy Fellowship Program
- ✓ AGRO Education Awards for Undergraduate and Graduate Student Travel sponsored 15 students to attend the Fall 2009 National Meeting
- ✓ Continued with Electronic Balloting for the second year
- ✓ The second AGRO New Investigator Award was presented to Dr. Jennifer Anderson at the Fall 2009 National Meeting in Washington.
- ✓ New Facebook page initiated for AGRO
- ✓ Continued with development of new AGRO webpage.

Plans for 2010

- ♦ Complete development of the "Member-Get-A-Member" program
- ♦ Expand the AGRO Welcome Package information and circulation
- ♦ Complete review of membership survey feedback, document perceived needs, and develop action items
- ♦ Call non-active members to establish personal contact and invite and encourage participation
- ♦ Establish a jobs posting site on the AGRO webpage.
- ♦ Continue with Graduate Student Luncheon, and Early Investigator Award.
- ♦ Support more student-led symposia such as “Recent Developments in Invertebrate and Vertebrate Repellents” to be held at the Washington Meeting
- ♦ Explore avenues such as webcasts for selected symposia from National Meetings.

AGRO Strategic Plan
2009 Accomplishments & 2010 Plans

GOAL 2

Foster constructive interactions among diverse communities to provide solutions to agricultural, public health, and environmental concerns.

Joe Massey— jmassey@pss.msstate.edu; 662-325-4725
John Johnston— john.j.johnston@usda.gov; 202-365-7175

Accomplishments in 2009

- ✓ Successfully submitted two proposals for symposia at the 2010 International Chemical Congress of Pacific Basin Societies (Pacifichem) to be held in Honolulu, Hawaii, USA, December 15 - 20, 2010. The titles are: "International Food Safety Issues and Opportunities" and "Rodenticide-Based Opportunities for Protection of Agriculture, Ecosystems and Public Health."
- ✓ Sponsored symposium "Government Collaborations in Scientific Research, Regulations, and Communications" at the 2009 Fall National Meeting.

Plans for 2010

- ♦ Support development of novel programming such as "Government Collaborative Studies: Research and Regulations" to increase interactions among scientists of different groups.
- ♦ Emphasize building symposia and other programming which enhances interaction among communities to solve problems.

GOAL 3

Build the infrastructure for becoming a global center for solutions to problems of plant, animal, environmental, and public health protection, and advancing scientific and regulatory harmonization.

Chris Peterson— cjpeterson@fs.fed.us; 662-325-0199
John Johnston— john.j.johnston@usda.gov; 202-365-7175

Accomplishments in 2009

- ✓ Sponsor a special symposium at the Washington meeting "Challenges and Initiatives in Harmonizing Maximum Residue Levels (MRLs) across the World" and initiate the formation of a global expert network
- ✓ Sponsored a special symposium, "Agricultural Research in Australia: Critical Issues Leading up to the 12th IUPAC International Congress on Pesticide Chemistry in Melbourne" at the Fall National Meeting in Washington
- ✓ Co-sponsor 3rd International Workshop on Crop Protection Chemistry in Latin America in Rio de Janeiro, Brazil. Submitted Innovative grants proposal to expand the presence of AGRO at this conference and to sponsor a student poster award.

Plans for 2010

- ♦ Post summaries of recent symposia on the AGRO webpage.
- ♦ Increase interaction with IUPAC Division of Chemistry and the Environment through cooperative programming at international workshops and other cooperative projects.
- ♦ Participate in the 12th IUPAC International Congress on Pesticide Chemistry in Melbourne Australia.
- ♦ Plan an electronic book for lay persons on Bioenergy Production and Biobased Products—Life Cycle Analysis

Minutes from the AGRO Division Business Meeting

Governance Meeting
Long-Range Planning Committee Meeting
Program Planning Committee Meeting

236th ACS National Meeting – Philadelphia, PA
Sunday, August 17, 2008, 5:30pm – 10:00pm
Crowne Plaza City Center
John Johnston – Chair

I. Secretary's Report – Liliana Schwartz

- Secretary's report was presented at the last Business Meeting.
- 234th ACS National Meeting Boston Minutes was prepared and distributed.
- Letters and e-mails to all participants in the 2007 AGRO Elections were sent.
- Submitted 2007 Annual Report to ACS.
- Electronic 2008 AGRO Elections being completed e-mailed letters to all candidates in the 2008 AGRO Elections.
- Business meeting for 236th ACS National Meeting in Philadelphia was scheduled. Conference room was reserved and food was ordered.

II. Treasurer's Report – Terry Spittler

While we enjoyed exceptionally good income from our T. R. Price Divisional operating account and from the Educational Trust Fund at JP Morgan over the last several years, annual value changes from both earnings and stock appreciation have recently leveled out and started to decrease. This unfortunately comes at a time when we have increased spending to enhance programming and membership attracting events. Our traditional fiscal reporting period does not reflect this year's (2008) steep decline in general income, nor the expenses expected for this meeting. It was suggested that an ad hoc financial oversight committee be formed to recommend spending guidelines this fall.

Action: AGRO Officers will create a task force to analyze AGRO finances and make recommendations for financial guidelines of the division in the future. This task force will be created in two months and will have a plan in place in four months from this meeting. **Motion passed.**

III. Technical Programming – Kevin Armbrust, Ellen Arthur, and Ken Racke

IV. 4th Pan Pacific Conference, Hawaii/August 17th 2008 – Al Barefoot and Joel Coats

- 4th Pan Pacific Conference, co-sponsored by ACS AGRO Division (chairs: Joel Coats and Al Barefoot) and Pesticide Science Society of Japan (chairs: Hiroshi Matsumoto and Koichi Yoneyama), was successful, better than initially expected: 236 total registrants including 24 complimentary registrations. The meeting comprised 10 technical sessions and 3 workshops. The total presentations were 206, including 85 invited speakers and 121 posters. ACS managed all the registration, housing etc. and participated in the programming too, doing a terrific job.
- Many abstracts came from China, but few scientists were able to attend the meeting due to budget cuts due to the earthquake, the Olympics, and difficulties in getting travel visas.
- Finance-wise, the meeting concluded with a positive balance of $13,206, from which refunds have to be made. The sponsors for this meeting included corporations and small companies, as well (see PICOGRAM).

V. Latin American Federation of Chemical Associations (FLAQ) Puerto Rico – Kevin Armbrust, Cathleen Hapeman, and Joe Massey

- The meeting was sponsored by Science National Foundation and ACS. The ACS co-sponsored a symposium at FLAQ on bioenergy. AGRO played a highly visible role in this symposium with a number of members giving presentations or moderating sessions.

VI. SETAC, North America 29th National Meeting, Tampa/November 2008 – Pamela Rice, Laura McConnell, and Stuart Cohen

- This meeting is concentrating on Modern Pesticides in Urban Environments, Risk Assessment, and Management having around 400 participants. The strategic goal of this meeting is to involve sibling organizations in AGRO.
  Action: AGRO will allocate up to $2000 for its attendance at the SETAC Meeting.
  Motion passed.

VII. 236th ACS National Meeting in Philadelphia Updates - Kevin Armbrust

- Updates regarding the meeting's activities (Posters Session, Blues and Brews Happy Hour, AGRO Symposium Brainstorming, Sterling B. Hendricks Memorial Lecture, International Award for Research in Agrochemicals Session, and the First AGRO Early Investigator's Award) were made.
- ACS, Pan Pacific, and SETAC had a big impact on division's scientific activity so far, displaying the biggest number of papers presented by AGRO so far.
- Amazon Gift Certificate Awards were introduced to encourage attendance on Thursday morning during the General Session.
- World events and the current economic climate were emphasized along with all the problems related to food, energy, and environment. AGRO will continue to address these issues in our future symposia or programming.

VIII. 2010's Venue(s) – Ken Racke

- It was proposed that AGRO be present during the 239th ACS National Meeting in San Francisco, Spring 2010. If a decision to go to San Francisco's Meeting will be made, it has to be announced in the web, next PICOGRAM etc. so that confusion will be avoided. Also, we have to decide in 2010 whether AGRO is returning to 2 national meetings per year. For this meeting there are already planned 9 symposia topics.
  Action: We empower the Executive Committee to designate the official business meeting in 2010. **Motion passed.**
- 12th IUPAC International Congress of Pesticide Chemistry in Melbourne, Australia/July 2010, hosted by The Royal Australian Chemical Institute Incorporated was announced with 6 different topics (see page 41 in the PICOGRAM v. 75). Organizers are encouraging AGRO members to participate with more papers, posters, and ideas for this meeting.
- Pacifichem Conference in December 15-20, 2010. John Johnston is the official reviewer for ACS for all abstracts submitted to the Agrochemistry section of Pacific Chem. John is also planning to organize two symposia at Pacifichem.
  Action: Consider proposal of AGRO in participating at the Pacific Chem in Honolulu 2010. **Motion passed.**

IX. Florida Pesticide Residue Workshop – Kevin Armbrust

- This workshop was successfully run for 45-yrs. AGRO is encouraged to participate. It was proposed that the membership will be increased by $10 and in this way the workshop participants will automatically become AGRO members.
  Action: A few people will draft a proposal to the Executive Committee for AGRO to participate at the Florida Residue Workshop.
  Motion passed.

X. Updates from the Chair: 2007-2008 AGRO Accomplishments – John Johnston

- A historical overview of the AGRO Division beginning with 1995 until today with regard to membership, total of papers and posters by year was made.
- Current membership consists of 1389 scientists, significantly higher than in 2007 when the membership proved to be the lowest in the division's history (around 1,100 members).
- Paper and posters submitted in 2008 seem to be around 440, the highest number of publications in AGRO's history (beginning with 1992).
- New and old brainstorming activities have been initiated and sustained during 2007 and 2008, such as: Sunday Business Meeting, Strategic Planning, Blues and Brews, Student Lunch, Thursday Afternoon "AGRO Symposium".
- Increasing AGRO Membership was one of the most important goals in this period of time. Initiated and developed ideas emphasized the following: attraction of younger participants, scientists from new areas by leveraging resources with other national and international organizations, funds allocation to effect change, communication improvement (new website, new logo, new banners, increase size of "AGRO Umbrella", redefine AGRO's Vision, Mission, Focus, and Goals.

- AGRO - Chemistry for and from Agriculture - is revitalized and its future looks very promising.

XI. Membership Committee Report & Strategic Goal #1 – Pat Rice, Dan Stout, Todd Anderson, Ellen Arthur and Terry Spittler

- The first Strategic Meeting's goal: to enhance membership experience by providing programs, products, services and opportunities for professional development and recognition.
- The objectives associated with this goal ought to create more personal relevance for AGRO members and they focus on improving AGRO's programs, products, and services.
- The initial plans involve: establishing a Welcoming Committee, forming Professional Advancement Committee, using members' talent, and using the senior members' experience and wisdom.
- Tasks involve developing the "Welcome Package", reviewing feedback obtained from a membership survey, developing a "Member-Get-A-Member" program, contacting non-active members, and developing a Professional Advancement Committee.
- Overall, membership increased from the last reported period. Alternative resources for shipping and transitioning to an outside mechanism have been used. The key labor will likely remain gratis, but we will incur postage and packaging costs (Dan Stout).

XII. Amity, India – Tanu Jindal

Dr. Tanu Jindal, a scientist at Amity Institute for Environmental Toxicology, Safety and Management in Uttar Pradesh, India. She gave a presentation on Amity University, one of the biggest research and business centers in Asia, recognized by the Indian government with over 50,000 students.

XIII. Awards Committee – Jim Seiber

- Allan Felsot received the AGRO Fellow Award as a result of his significant work, dedication, enthusiasm, and creativity invested in division's advancement during the years.
- 2008 AGRO Awards were mentioned. They are:
    - ACS International Award for Research in Agrochemicals, co-sponsored by BASF and DuPont Crop Protection. Recipient: Dr. David Soderlund.
    - Sterling B. Hendricks Memorial Lectureship Award, co-sponsored by USDA-ARS and AGFD. Recipient: Dr. Fergus Clydesdale
    - AGRO Early Investigator, sponsored by Dow AgroSciences. Recipient: Dr. Ashli Brown
- Calls for nominations AGRO Division Fellow Award, ACS International Award for Research in Agrochemicals, Sterling B. Hendricks Memorial Lectureship Award, and AGRO Early Investigator were made.

XIV. 2008 AGRO Election Report – Laura McConnell

- AGRO Elections were held from May 27 to June 13 for Officers to begin service on January 1, 2009 (see PICOGRAM v.75, page 42). For the first time, the elections were done electronically using VOTE-Now.com, Pro Silver Service (contact: jclaiborne@vote-now.com). We received a 10% discount provided to ACS Divisions. The advantages presented were significant: instantaneous results available on-line, secure voting, and no paper or stamps.
- Process included:
    - First class post cards with access code to those without e-mail and to members with e-mail "bounces".
    - Custom e-mail with access codes to all members.
    - Two e-mail remainders to non-voting members.
    - Participation was 18.9%.
    - Cost involved: $1492.

XV. Councilor Report: Joel Coats and Barry Cross

Barry was not able to attend the council meeting as he was recovering from surgery. Joel gave the report. ACS has adopted a new formula for division allocations that is now based upon attendance at technical sessions and poster sessions. It also gives equal credit to divisions cosponsoring symposia. Attendance calculations are based upon attendance reports submitted by symposium organizers, so it is CRITICAL that these be turned into ACS at the end of sessions.

- 65% funding is coming from programming
- 50% attendance to oral sessions

XVI. Communications (formerly Publications) Committee – Cathleen Hapeman

- Continued to publish 2 PICOGRAMS even though AGRO only at one National ACS Meeting

- PICOGRAM is now mailed first class because third class has too many delays
- Color was included on the cover of PICOGRAM v. 75 – total cost for ~ $14K
- The Femtogram, the AGRO e-newsletter with Tom Potter as editor, made its first debut last Fall. It is a new communication venue to keep the membership informed of important events, achievements, and opportunities. Distribution is by AG-LIST and the website.
- AG-LIST is working well with ~ 900 members
- The new website is under development and will be on line Fall 2008
- The new logo is on the new banners
- Considering a lay book on bioenergy to educate the general public (see concept below)

ACS *(probably in a format of Symposium Series)* Book Concept

Biofuels: Challenges, Concerns, and Consequences

The 21st century will be governed largely by issues related to global energy use, energy demand, and distribution of energy resources. Alternative energies, such as those derived from biological sources, are anticipated to play an increasing role in meeting future demand.

Reliance upon agriculture to provide transportation fuels in addition to food, feed, and fiber represents a major paradigm shift that impacts global food security. This shift requires careful consideration and analysis.

To be sustainable, bio-energy production must not deplete the natural resources or systems upon which agriculture depends. This book addresses the challenges and possible solutions in producing bio-energy while protecting resources vital to agriculture.

- scientists will still write chapters but will present the issues in a teaching format
- outreach to public about important global issue (informed/concerned citizens)
- soft covered, book, more accessible
- already have a commitment from University of Maryland technical writer as co-editor
- verbal acceptance from 10 authors and more are being sought

XVII. Hospitality Committee – Pat Rice, Jim Brady, Joe Massey and Julie Eble

- At the 236th ACS National Meeting in Philadelphia 10 companies contributed $2000.00 to the Coffee Lounge.
- It was announced that the AGRO Division Awards and Social will be on Tuesday, 6:00 – 8:00pm at the Liberty C, Crowne Plaza City Center.

XVIII. Public Relations Committee – Jeff Jenkins

Clydesdale Press Release 8/13/08

The Agricultural Research Service (ARS), U.S. Department of Agriculture's primary research agency, the Agriculture and Food Chemistry Division, and Agrochemicals Division of the American Chemical Society (ACS) will award Dr. Fergus M. Clydesdale with the 2008 Sterling B. Hendricks Memorial Lectureship. This Lectureship was established in 1981 by ARS to honor the memory of Sterling B. Hendricks and to recognize scientists who have made outstanding contributions to the chemical science of agriculture.

Dr. Clydesdale will be honored at the 236th ACS National Meeting & Exposition in Philadelphia, PA. With over 160,000 members, the ACS is the world's largest scientific society. The award presentation on August 19th titled "*A Nutritional Odyssey: From Famine to Feast, Can Science & Policy Solve the Dilemma?"* will be followed by a reception.

Dr. Clydesdale is currently Distinguished Professor and Head of the Department of Food Science at the University of Massachusetts, Amherst, as well as Director of both its Strategic Research Alliance and Strategic Policy Alliance, also in the Department of Food Science.

Soderland Press Release 8/13/08

The Agrochemicals Division of the American Chemical Society (ACS) will present its International Award for Research in Agrochemicals to Dr. David M. Soderlund, Professor of Insecticide Toxicology and Chair or the Entomology Department at Cornell University's New York State Agricultural Experiment Station in Geneva.

Dr. Soderlund will be honored at the 236th ACS National Meeting in Philadelphia, PA. With over 160,000 members, the ACS is the world's

largest scientific society. The BASF Corporation and DuPont Crop Protection co-sponsored award presentation on August 19th marks the beginning of an Agrochemicals Division 1-day symposium.

Dr. Soderlund received a B.S. degree in Biology from Pacific Lutheran University in 1971 and a Ph.D. in Entomology from the University of California at Berkeley in 1976. After postdoctoral research at Rothamsted Experimental Station in the U.K he joined the Cornell University in 1978.

XIX. Educational Committee – John Johnston

- There are two educational programs at the 2008 Fall ACS Meeting in Philadelphia: The Student Travel Grant Research Poster Symposium and the Early Investigator Award.

  a) Student Travel Grant Research Poster Symposium: 21 graduate students have been awarded AGRO Division travel grants to present their research posters at the ACS National Meeting in Philadelphia. Student winners represent thirteen universities from across the US. Names and titles are listed on pages 28, 29 of the PICOGRAM v. 75.

  Expeditures: 21 x $806 (award, ACS student membership, registration) + $900 (first, second and third place winners) = $17,826
  Income: Bayer CropScience = $5,000

  b) Early Investigator Award: AGRO is sponsoring two Early Investigator presentations at the 2008 Fall Meeting in Philadelphia.

  Dr. Ashli Brown, Assistant Professor, Mississippi State University, Department of Biochemistry and Molecular Biology. Dr. Brown will present her paper in the Bioenergy Production: Challenges, Concerns, and Consequences Symposium on Tuesday afternoon, August 19.

  Dr. Tanu Jindal, Amity Institute for Environmental Toxicology, Safety, and Management
  Amity University Uttar Pradesh, India. Dr. Jindal will present her paper in the "New Developments and Issues in Agrochemical Sciences Symposium: Common crop protection practices and the possibility of groundwater contamination in different types of soil through leaching of currently-used pesticides" on Thursday morning, August 21.

  Expenditures: $3,500(First Place) + $1,285 (Second Place) = $4,785
  Income: = $0

  c) Pan Pacific Conference on Pesticide Science: AGRO sent a student to the Pan Pacific Conference on Pesticide Science, Hilliary Hodgdon, Animal Biotechnology and Biomedical Sciences Program
  University of Massachusetts-Amherst, Amherst, MA. She presented: "Binary Mixtures of Pyrethroids Augment L-Glutamate Release by Interacting with Voltage-Sensitive Calcium and Chloride Channels in Isolated Presynaptic Nerve Terminals from Rat Brain".

  Expenditures: $2,916

  Summary of Education Funds
  Endowment: $400,000

  Percent of endowment spent = $20,527/$380,902 = 5.4%

XX. By-Laws Committee

Don Baker wasn't able to attend our meeting due to the sudden loss of his wife and to health issues he is experiencing lately. The Executive Committee members have wondered whether Don will be able to be actively involved as he always was. The Executive Committee assigned Rod Bennett to contact him and find out more about his thoughts regarding his volunteering activity within AGRO Division.
Action: Based upon discussions with Don Baker, Rod Bennett is proposed Chair of the By-Laws Committee and Don Baker will continue his activity as a member of the same committee. **Motion passed.**

XXI. Miscellaneous – Jeanette Van Emon

The Western Regional ACS meeting is being held September 23rd-27th in Las Vegas Nevada. Jeannette asked AGRO to co-sponsor the meeting.
Action: AGRO will co-sponsor the Meeting in Las Vegas up to $500. **Motion passed.**

Treasurer's Report

236th ACS National Meeting – Philadelphia, PA
Sunday, August 17, 2008
Crowne Plaza City Center

AGRO Division Business Meeting
Terry D. Spittler – Treasurer

	7/31/07	12/31/07	7/31/08
CHECKING ACCOUNT	$49,497	$16,826	$8,893
INVESTMENTS			
Spectrum Income (T. R. Price)	170,005	175,443	173,566
Prime Reserve (T. R. Price)	1,263	1,289	1,310
Educational Trust (JPMorgan)	464,977	468,979	380,902*
ACS Investment Pool	26,880	27,351	25,936
TOTAL INVESTMENTS	$636,272	$673,062	$581,714
TOTAL ASSETS	**$685,769**	**$689,888**	**$590,607**

*$40,000 to checking 3/08

Bylaws of the AGRO Division of the American Chemical Society *

** Effective October 27, 2000. Approved, as amended, by the Committee on Constitution and Bylaws, acting for the Council of the American Chemical Society.*

Bylaw I. Name and Objects

Section 1. The name of this organization shall be the Division of Agrochemicals (hereinafter referred to as "the Division") of the AMERICAN CHEMICAL SOCIETY (hereinafter referred to as "the SOCIETY").

Section 2. The objects of the Division shall be to bring together persons particularly interested in agrochemicals, to consider all scientific aspects of chemistry relevant to the control of pests of agricultural or public health significance and to other methods for enhancing or modifying agricultural productivity, to develop and improve the professional stature of chemists with these interests, and to render whatever service it may to the scientific and lay communities on the topic of agrochemicals.

Bylaw II. Members and Affiliates

Section 1. Membership in the Division shall be open to all members of the SOCIETY. Application for membership shall be made in writing to the Secretary of the Division and shall be accompanied by one year's dues.

Section 2. A National Affiliate of the SOCIETY may apply to the Secretary to become a National Affiliate of the Division. Provided that Division dues established for National Affiliates are paid, a National Affiliate shall have all the privileges of membership in the Division except those of voting for or holding an elective position of the Division, voting on articles of incorporation or bylaws of the Division, or serving as a voting member of its Executive Committee.

Section 3. The Division may accept Division Affiliates who are not members or National Affiliates of the SOCIETY but who wish to participate in the activities of the Division. Such affiliates shall be entitled to all the privileges of membership in

the Division save those withheld by the Bylaws of the SOCIETY.

Section 4. Members may resign their membership in the Division by submitting their resignation, in writing, to the Secretary during the year for which their dues are paid.

Section 5. The name of any member of the Division who is in arrears in payment of dues by as much as two years shall be stricken from the rolls. A member dropped for nonpayment of dues may be reinstated upon payment of arrearages.

Section 6. Affiliates shall retain affiliate status only so long as payment is made of Division dues. An affiliate's name is to be stricken from the rolls as soon as the affiliate is in arrears in the payment of dues.

Section 7. The anniversary dates of Division members and National Affiliates of the Division shall coincide with their anniversary dates in the SOCIETY.

Bylaw III. Officers and Councilors

Section 1. The officers of the Division shall be a Chair, a Chair-Elect, a Vice-Chair, a Secretary, and a Treasurer. The Chair-Elect shall automatically succeed to the office of Chair upon expiration of the latter's term of office or if this office becomes vacant. The Vice-Chair shall automatically succeed to the office of Chair-Elect upon expiration of the latter's term of office or if this office becomes vacant. The offices of Secretary and of Treasurer may be held by one individual. Only MEMBERS are eligible to hold elective positions.

Section 2. The duties of the Chair shall be to preside at meetings of the Executive Committee, to carry into effect the decisions and recommendations of the Committee, to preside at stated meetings of the Division, and to appoint all committees except as otherwise provided.

Section 3. The duties of the Chair-Elect shall be to serve in the absence of the Chair of the Division and to act as Chair of the Program Committee.

Section 4. The duties of the Vice-Chair shall be to serve in the absence of the Chair-Elect and to act as Assistant Chair of the Program Committee, with particular emphasis on planning and developing technical programs.

Section 5. The duties of the Secretary shall be to keep minutes of all meetings of the Division and of the Executive Committee; to keep a roll of Division members and affiliates and to submit the same annually to the Executive Director of the SOCIETY for verification as provided in the Bylaws of the SOCIETY; to conduct the business correspondence of the Division as assigned to the Secretary by the Chair or by the Executive Committee; to prepare and submit an annual report of Division activities to the SOCIETY as required in the SOCIETY's Bylaws; to perform such other duties as may, from time to time, be assigned by the Chair or Executive Committee or required by the SOCIETY's Bylaws. The Secretary shall send to each member, at least two weeks before the regular meetings of the Division, abstracts of papers to be presented at said meetings.

Section 6. The Treasurer shall act as custodian of the funds of the Division, collect dues and other revenues, and pay the bills of the Division after the same have been authorized by the Executive Committee. The Treasurer shall maintain accurate records of receipts and disbursements and shall submit a report of the financial condition of the Division at the annual meeting of the Division. The Treasurer shall furnish a surety bond, the premium for which shall be paid from Division funds.

Section 7. Councilors and Alternate Councilors shall represent the Division on the Council of the SOCIETY as provided in the Constitution and Bylaws of the SOCIETY.

Section 8. The Division shall have an Executive Committee, which shall consist of the officers of the Division; the Immediate Past Chair of the Division; the Councilors and Alternate Councilors; the Chairs, Chairs-Elect, Vice-Chairs, and Immediate Past Chairs of Subdivisions, if any; and fifteen (15) Members-at-Large. The Chair of the Division shall serve as Chair of the Executive Committee.

Section 9. The officers of the Division other than the Chair and the Chair-Elect shall be elected by mail ballot as described elsewhere in these bylaws.

Section 10. At the annual meeting of the Division, the Executive Committee shall appoint a Nominating Committee consisting of at least three members, one of whom shall be the Immediate Past Chair of the Division, who shall serve as Chair of this Committee. This Committee shall nominate two candidates for the office of Vice-Chair and at least ten (10) candidates for the positions as Members-at-Large to be filled on the Executive Committee. This Committee shall nominate candidates for each of the following offices to be filled: Councilor, Alternate Councilor, Secretary, and Treasurer. This Committee shall submit a report in writing to the Chair of the Division for preparation of the ballot to be mailed to the membership. Additional nominations may be made in writing by any group of at least five members and presented to the Chair of the Division not less than three months prior to the fall meeting.

Section 11. Officers and Members-at-Large shall be elected by the members and Division Affiliates of the Division. Only members of the Division may vote for Councilors and Alternate Councilors. The Secretary or other designated officer of the Division shall prepare an election ballot, on which shall appear the names in order chosen by lot of all candidates nominated and found willing to serve. In all Division balloting conducted by mail, the ballot voted shall be sealed, without voter identification, in a special ballot envelope. The special ballot envelope, bearing no voter identification, shall be enclosed in a larger envelope upon which—or within which, on a separate slip—shall be hand-inscribed the name of the member voting; the larger envelope shall then be sealed and forwarded to the Chair of the Tellers Committee. The Tellers shall count the ballots thus received, using the list of members provided by the Secretary to verify the eligibility of all those voting. Any ballot envelope not validated by the voter's accompanying hand-inscribed name shall be rejected. The Secretary shall set and announce in advance of the neither balloting the interval during which ballots must be received to be counted; this interval shall not be less than four nor more than seven weeks following the ballot mailing. The Tellers Committee, appointed by the Chair of the Division, shall be responsible for counting all valid ballots received within the interval and shall certify the results to the Secretary, who shall in turn certify the results to the SOCIETY, the elected officials, and the Division. Elections are to be by plurality, should there be more than two candidates for an office. Resolution of a tie vote shall be made by the Executive Committee.

Section 12. The Chair, the Chair-Elect, the Vice-Chair, the Secretary, and the Treasurer of the Division shall serve for one year or until their successors are elected.

Section 13. The terms of office of the Members-at-Large of the Executive Committee shall be three years. Five Members-at-Large shall be elected each year.

Section 14. The terms of Councilors, Alternate Councilors, and all officers excluding the Chair, Chair-Elect, and Vice-Chair shall begin on January 1 following their election. The terms for Chair, Chair-Elect, and Vice-Chair shall begin at the conclusion of the fall meeting of the SOCIETY.

Section 15. Vacancies in offices other than Chair and Chair-Elect shall be filled by the Executive Committee. Incumbents so selected shall serve until the next regular election.

Bylaw IV. Councilors

The Division shall have Councilors and Alternate Councilors whose terms of office shall be three years. Alternate Councilors shall serve only for specific meetings of the Council when a Councilor is not able to attend.

Bylaw V. Committees

Section 1. There shall be a Program Committee, consisting of three or more members, one of whom shall be the Chair-Elect of the Division, who shall serve as Chair of the Committee. A second member of the Committee shall be the Vice-Chair. The Program Committee shall have the entire responsibility for organizing the program of papers for all Division meetings. It shall work cooperatively with other Divisions of the SOCIETY and other bodies in planning joint sessions and symposia of mutual and timely interest.

Section 2. There shall be a Membership Committee of three or more members. This Committee shall aggressively promote membership in the Division by members of the SOCIETY.

Section 3. There shall be a Finance Committee of two or more members. This Committee shall audit the accounts of the Treasurer prior to the business meeting of the Division and report its findings at the annual meeting. This Committee shall advise the Executive Committee on financial resources.

Section 4. There shall be an Awards Committee of at least six members. This Committee shall maintain and develop the Division and International Awards Programs.

Section 5. There shall be a Hospitality Committee of at least two members. This Committee shall direct social events in coordination with other committees and maintain a hospitality table at Division meetings.

Section 6. There shall be a Publication Committee of at least three members. This Committee shall be responsible for publication of the Division newsletter, PICOGRAM, and other Division publications.

Section 7. Special committees may be appointed to consider, conduct, and report upon such special matters as may be delegated to them.

Section 8. Except where otherwise provided, committee appointments shall be made by the Chair, with the advice and approval of the Executive Committee.

Bylaw VI. Dues

Section 1. Members of the Division shall pay annual dues, the exact amount to be decided by the Executive Committee. Dues are payable in advance. Members who have been granted emeritus status by the SOCIETY and who are interested in the work of the Division shall be granted all privileges of Division membership without the payment of annual dues.

Section 2. Affiliates shall pay annual dues of $2.00 more than members; except that Division Affiliates who are regularly matriculated students specializing in a chemical science shall pay annual dues of an amount to be decided by the Executive Committee.

Bylaw VII. Subdivisions

Section 1. Composition. The Division may sponsor Subdivisions devoted to specialized fields within the area of Division interest. Membership in the Division shall be a requirement for membership in a Subdivision.

Section 2. Formation. Formation or discontinuance of a Subdivision shall be at the discretion of the Executive Committee of the Division. Steps to initiate a Subdivision may be made by petition of a group of Division members to the Executive Committee or by the action of the Executive Committee. The scope of the activities of any Subdivision shall be defined by the Executive Committee.

Section 3. Officers. Upon approval of the formation of a Subdivision, the Executive Committee of the Division shall appoint a Chair, Chair-Elect, Vice-Chair, and Secretary for the Subdivision. The Chair-Elect shall assume the office of Chair after one year. In succeeding years the Subdivision shall elect at the annual meeting a Chair-Elect and a Secretary. The Chair, a Chair-Elect, and Secretary shall constitute a Steering Committee for the Subdivision. This Steering Committee shall report through the Chair of the Subdivision and be responsible to the Executive Committee of the Division, of which Subdivision Chairs shall be members ex officio.

Section 4. Funds. The necessary expenses for each Subdivision shall be authorized by the Executive Committee of the Division from Division funds and shall be paid by the Treasurer of the Davison upon the usual authentication.

Bylaw VIII. Meetings

Section 1. There shall be a meeting of the Division at each national meeting of the SOCIETY unless the Executive Committee votes otherwise, provided the requirements for a minimum number of meetings as specified in the SOCIETY Bylaws shall be met.

Section 2. The annual meeting of the Division shall be held at the fall meeting of the SOCIETY. Division business requiring vote of the membership shall be conducted only at this meeting, except as provided elsewhere in these bylaws. However, voting by the membership may be conducted by mail or as directed by the Executive Committee.

Section 3. Special meetings of the Division may be called by the Executive Committee, provided notice is given to the membership in writing or by publication in Chemical & Engineering News at least two months in advance. Special meetings may not be held within one month before or after a national meeting.

Section 4. Fifteen (15) members of the Division shall constitute a quorum for the conduct of business.

Section 5. The fee for registration at any special meeting shall be decided by the Executive Committee in accordance with the Bylaws of the SOCIETY.

Section 6. The rules of order in the conduct of Division meetings not specifically provided in these bylaws or in the SOCIETY's documents shall be the most recent edition of Robert's Rules of Order, Newly Revised.

Bylaw IX. Papers

Section 1. The Program Committee may approve or reject papers submitted for presentation before any meeting of the Division.

Section 2. The rules for papers presented before meetings of the SOCIETY as outlined in the Bylaws and Regulations of the SOCIETY shall govern the Division.

Bylaw X. Amendments

Section 1. These bylaws may be amended at any annual meeting of the Division by a two-thirds (2/3) vote of the members present. All amendments shall be submitted in writing to the Secretary at least sixty (60) days prior to the meeting. Upon approval of the Executive Committee, the Secretary shall send the text of the proposed amendment to the members of the Division at least thirty (30) days prior to the annual meeting.

Section 2. Amendments shall become effective upon approval by the Committee on Constitution and Bylaws, acting for the Council, unless a later date is specified.

Bylaw XI. Dissolution

Upon dissolution of the Division, any assets of the Division remaining thereafter shall be conveyed to such organization then existent as is dedicated to objects similar to those of the Division and the AMERICAN CHEMICAL SOCIETY, or to the AMERICAN CHEMICAL SOCIETY, so long as whichever organization is selected by the governing body of the Division at the time of dissolution shall be exempt under Section 501(c)(3) of the Internal Revenue Code of 1954 as amended or under such successor provision of the Code as may be in effect at the time of the Division's dissolution.

American Chemical Society
AGRO DIVISION
238th ACS National Meeting
August 16-20, 2009
Washington, DC
E.L. Arthur and K.L. Armbrust, *Program Chairs*

PROGRAM

DIVISION MEETING
AGRO Business Meeting
Sunday 5:30 – 10:00 pm
TBA

SOCIAL EVENTS
AGRO Awards Social
Tuesday 6:00 – 8:00 pm
Renaissance Washington
--Congressional C
Members/Guests welcomed; see page 9

Sterling B. Hendricks Award Lecture Reception
Monday 11:30-1:30 pm
Crowne Plaza, Liberty B

Graduate Student Luncheon
Wednesdy 12:00 – 1:00 pm
Renaissance Washington
--Renaissance, West A,
Invitation only; see page 24

Future Symposium Organizers Brainstorming, Blues & Brews
Wednesday 5:00 – 7:00 pm
Renaissance Washington -- Grand Ballroom South
All members welcomed; see page 31

SUNDAY MORNING

Recent Developments in Invertebrate and Vertebrate Repellents
G. E. Paluch, J. R. Coats, and J. Johnston, *Organizers*

Section B
Renaissance Washington -- Renaissance West A

9:15 — Introductory Remarks.

9:25 —1. Characterization of botanical terpene activity in arthropods. **G. E. Paluch**, J. R. Coats, L. Bartholomay

9:50 —2. Discovery of novel mosquito repellents from structure-activity studies. **M. Tsikolia**, U. Bernier, S. Slavov, C. D. Hall, G. G. Clark, K. J. Linthicum, A. R. Katritzky

10:15 — Coffee Break.

10:30 —3. Structure-activity relationship studies on intermedeol and callicarpenal: Two arthropod repellents identified from the Southern folk remedy, *Callicarpa americana*. **C. L. Cantrell**, J. A. Klun, J. Becnel, J. Pridgeon

10:55 —4. Efficacy of the plant-based repellent, BioUD® against mosquitoes and ticks. **B. W. Bissinger**, J. Zhu, C. S. Apperson, D. W. Watson, D. E. Sonenshine, R. M. Roe

11:20 —5. Essential oil insect repellents: A formulator's challenge. **R. Bradbury**

Application of Natural Products in Organic Farming
Cosponsored by GLOBAL
K. Chauhan and S. O. Duke, *Organizers*

Section C
Renaissance Washington -- Grand Ballroom South

8:30 — Introductory Remarks.

8:35 —6. Current and future herbicides available for organic farmers. **S. O. Duke**, F. E. Dayan

9:00 —7. Management and regulation of natural products in biologically based weed control systems. J. R. Teasdale, **J. Lydon**, C. P. Rice

9:25 —8. Opportunities for the use of plant essential oil-based insecticides in organic agriculture. **M. B. Isman**

9:50 — Coffee Break.

10:05 —9. Natural products as sources for biopesticides. **M. E. Koivunen**, P. G. Marrone

10:30 —10. Current status and future opportunity for semiochemicals in organic farming. **P. Kirsch**

10:55 —11. Semiochemicals: Application in organic farming. **K. R. Chauhan**

11:20 —12. Natural product based biopesticides and the organic market. **M. P. Braverman**, J. J. Baron, D. L. Kunkel, V. Starner

Organic Phosphate Transport, Fate, and Impact on the Chesapeake Bay
Cosponsored by GLOBAL
L. Heighton, *Organizer*
W. F. Schmidt, *Organizer, Presiding*

Section D
Renaissance Washington -- Grand Ballroom Central

9:45 — Introductory Remarks.

9:50 —13. Phosphorus composition of wet and dried poultry litter-amended soil by enzyme hydrolysis and solution 31P-NMR. **N. R. Johnson**, J. E. Hill

10:15 — Coffee Break.

10:30 —14. Raman spectra of organic (myo-inositol hexakis phosphate) and inorganic spectra show pH dependence. **L. Heighton**, W. F. Schmidt

10:55 —15. Phytate degradation and transport in poultry manure-amended soil under simulated leaching. **C. Giles**, J. Hill

11:20 —16. Chemistry and dynamics of organic phosphorus in the environment. **B. L. Turner**

SUNDAY AFTERNOON

Biotechnology Risk Assessment: Minding and Managing the Threats Around Us
Cosponsored by GLOBAL
S. Ripp, *Organizer*

Section A
Renaissance Washington -- Auditorium

1:15 — Introductory Remarks.

1:20 —17. Antimicrobial activity of metal-containing nanoparticles is not restricted to pathogenic bacteria. **A. Anderson**

1:45 —18. Electrochemical biosensors based on advanced nanomaterials for toxicity risk assessment. **S. Andreescu**

2:10 —19. Genetic risk assessment: Current strategies to evaluate transgenic risks. **A. Good**

2:35 —20. Understanding and coping with social risk in biotechnology risk assessment. **P. Thompson**

3:00 — Coffee Break.

3:15 —21. Nanotechnologies for microbicidal applications: Identification of risks and opportunities. **N. S. Swami**

3:40 —22. Risk assessment for nanomaterials: Challenges and management approaches. **I. Linkov**, J. Steevens

4:05 —23. Mixtures of 17α-ethinylestradiol (EE2) and aqueous C60 aggregates decrease bioavailability of EE2 and change C60 aggregate characteristics. **J -W. Park**, T. Henry, S. G. Ard, F -M. Menn, R. N. Compton, G. S. Sayler

Recent Developments in Invertebrate and Vertebrate Repellents
G. E. Paluch and J. R. Coats, *Organizers*

Section B
Renaissance Washington -- Renaissance West A

1:30 —24. Plant essential oils as repellents and/or deterrents to agricultural pests. **M. B. Isman**

1:55 —25. Mechanisms of vertebrate herbivore repellency. **B. A. Kimball**, J. D. Taylor

2:20 —26. Research on tick repellents: Playing catch up. **J. F. Carroll**

2:45 —27. Mosquito repellents for the tropics: From the lab to the field. **J. Grieco**

3:10 — Coffee Break.

3:25 —28. Research and development of all natural, plant-derived insecticides, pesticides, and repellents for the control of disease-vectoring arthropods of public health importance. **M. Dolan**

3:50 —29. Impact of technical, ethical and regulatory developments on registration of repellents. **C. Fuentes**

4:15 —30. Evaluation of insects repellents from research to consumer protection. **D. Strickman**

AGRO New Investigator Award / New Developments & Issues in Agrochemical Science
E. L. Arthur, *Organizer*
A. S. Felsot, *Organizer, Presiding*

Section C
Renaissance Washington -- Grand Ballroom South

2:00 — Introduction. New Developments & Issues in Agrochemical Science.

2:10 —31. Pymetrozine inhibits feeding in Asian citrus psyllid, *Diaphorina citri*: Potential for preventing greening disease bacterium transmission. **D. R. Boina**, Y. Youn, L. Stelinski

2:30 —32. Unsuitability of fluorescein for use as a soil tracer dye. **C. J. Peterson**

2:50 — Coffee Break.

3:05 — Introduction. New Investigator Award.

3:20 —33. Characterization of acetylcholinesterase inhibition by botanically-derived terpenoids in arthropods ***- AGRO New Investigator Award Winner***. **J. Anderson**, G. E. Paluch, J. R. Coats

3:40 —34. Effect of flavonoid antioxidants on the formation of acrylamide toxin in potato products. **Y. Zhang**, Y. Zhang

4:00 —35. Effects of organic amendments on herbicide behaviors in soil. **L. I. Delgado-Moreno**

Agrochemical Residue and Metabolism Chemistry
Cosponsored by GLOBAL
D. J. Smith, *Organizer*
T. A. Wehner and J. J. Johnston, *Organizers, Presiding*

Section D
Renaissance Washington -- Grand Ballroom Central

1:30 — Introductory Remarks.

1:45 —36. Simultaneous determination and confirmation of melamine and cyanuric acid in fish kidneys by LC/MS/MS. **C. B. Nochetto**, C. B. Stine, N. G. Rummel, D. N. Heller, R. Reimschuessel

2:05 —37. Chlorophacinone metabolism and inhibition in Wistar Norway rats and meadow voles using liver microsome experiments. **T. M. Primus**, K. E. Horak, C. R. Wermager

2:25 —38. Determination of 20,25-diazacholesterol residues in tissues of exposed birds. **D. A. Goldade**, L. E. Hulslander, C. A. Yoder

2:45 —39. Green residue laboratory: Development of microtechnology and automation for the analysis of pesticides in plants, soil, water, and post consumer resin samples. **S. Abdel-Baky**, J. Jones, D. Dohnert, M. Saha, A. Finch, J. M. Stewart

3:05 — Coffee Break.

3:20 —40. Green residue chemistry: High throughput in residue analyses for soil, water, and plant samples utilizing micro-technology and automation. **S. Abdel-Baky**, M. Saha, H. Nejad, R. Gooding, C. Downs, J. Jones

3:40 —41. Multiresidue analysis for pharmaceuticals, polar pesticides, and related compounds: SPE and UHPLC considerations. **M. S. Young**, J. C. Shia

4:00 —42. Analytical method for the determination of chlorate in animal matrices. **D. J. Smith**, P. B. Bahnson, J. B. Taylor

4:20 — Concluding Remarks.

MONDAY MORNING

International Award for Research in Agrochemicals

Don Wauchope and Friends: Reflections on the Future of Pesticide Environmental Chemistry

Financially supported by
BASF Corp. and DuPont Crop Protection
Cosponsored by GLOBAL
A. S. Felsot, *Organizer*

Section A
Renaissance Washington -- Auditorium

Trends in Agrochemical Research
8:15 — Introduction and Award Presentation.

8:30 —43. Don Wauchope and friends: Reflections on the future of pesticides environmental chemistry. **J. Menn**

8:45 —44. Award address: The environmental chemistry of agricultural pesticides. **R. D. Wauchope**

9:30 —45. Research and development of agrochemicals over the past 40 years. **J. B. Unsworth**

10:00 — Coffee Break.

10:15 —46. Chemicals and chemistry in agriculture and the role of USDA-ARS. **C. J. Hapeman**

10:45 —47. Environmental research in the USDA-ARS Southern Weed Science Laboratory, Stoneville, MS: Pool tables to 21-gun salutes. **M. A. Locke**, R. M. Zablotowicz

11:15 —48. Innovations of agrochemicals and IPM. **K. Tanaka**

Insect Management in Medical, Veterinary, and Urban Settings
Cosponsored by GLOBAL
S. Cope and S. O. Duke, *Organizers*
D. Strickman, *Organizer, Presiding*

Section B
Renaissance Washington -- Renaissance West A

10:00 — Introductory Remarks.

10:05 — The Entomology Action Landscape for the American Public.

10:25 — The Entomology Action Landscape for the Military.

10:45 —49. Advice to the public on using repellents. **D. Strickman**

11:05 —50. Molecular design and semi-field performance of highly selective carbamates for control of the malaria mosquito, *Anopheles gambiae*. **J. R. Bloomquist**, T. D. Anderson, P. R. Carlier, J. Githure, J. Hartsel, P. C -H. Lam, M. Ma, H. Manda, J. M. Mutunga, S. L. Paulson, M. M. Totrov, D. M. Wong, E. Wong

11:25 —51. Antiparasitic isoxazoline: Novel chemistry of ligand-gated chloride channel (LGCC) blockers. **Y. Ozoe**, M. Asahi, F. Ozoe, K. Nakahira, T. Mita

AGRO Division Poster Session

E. L. Arthur and J. J. Johnston
Organizers, Presiding

8:00 - 12:00

Section C
Renaissance Washington -- Renaissance East

Recent Developments in Invertebrate and Vertebrate Repellents.

52. Biological activity of pyrethroid impregnated paint upon Daphnia magna. **I. Benitez**, F. R. Medina

Non-dietary Human Exposure and Risk Assessment .

53. Safety evaluation of newly developed carbamate insecticides. **Y. Jiang**, F. Ekström, P. R. Carlier, J. Hartsell, M. Ma, J. R. Bloomquist

Lawrence A. Burns Memorial Symposium on Advances in Environmental Modeling of Pesticides.

54. Development of EXPRESS modeling platform. L. Burns, L. A. Suárez, S. Bird, **R. D. Parker**

55. Recent code enhancements to the pesticide root zone model (PRZM): Linked watershed modeling and harmonization with FOCUS models. **J. M. Cheplick**

56. A new PRZM algorithm for predicting biphasic degradation of pesticide in soil using coupled time-dependent sorption and degradation kinetics: Model-data evaluation. **W. Chen**, A. M. Wadley, S. Hayes

Exposure to Chemicals in Urban Aquatic Environments.

57. Quantification of fungicides in snow-melt runoff from turf: A comparison of four extraction methods. **B. L. Barber**, P. J. Rice, J. L. Rittenhouse, W. C. Koskinen

Advancements in Geospatial Risk Assessment and Techniques.

58. Use of readily available geospatial information to demonstrate similarity of a European soil to soils found in the United States. **R. L. Warren**

59. Pre-Serve: A web-based mapping application for the delivery of geographically-specific pesticide mitigation instructions. **M. F. Winchell**, N. Floersch, K. H. Carr, D. I. Gustafson, J. L. Honegger

60. Acetochlor stewardship. **R. Vamshi**, G. G. Hoogeweg, D. I. Gustafson, R. Boeker

Managing Agricultural Gas and Particle Emissions.

61. Air-water gas exchange of currently used pesticides in the Canadian arctic. L. M. Jantunen, F. Wong, **T. F. Bidleman**, G. A. Stern

62. Ammonia emissions from feedlot surface of beef deep-bedded monoslope facilities. **M. J. Spiehs**, B. L. Woodbury, R. A. Eigenberg, B. E. Doran, K. D. Kohl

63. Open-path micrometeorological methods for measuring methane gas emission from agricultural sites. **K. S. Ro**

64. Development of VOC quantitation methods for livestock barns. **C. Xiao**, B. Bogan, A. Heber

65. Diet effect on the type and spatial distribution of odorous emissions from beef cattle. **B. L. Woodbury**, R. A. Eigenberg, V. H. Varel, M. J. Spiehs

66. Distinguishing sources and fate of atmospheric reactive nitrogen and particulate matter using stable isotopes. **J. D. Felix**, E. M. Elliott, J. Ham, L. L. McConnell

67. Measurement of ammonia, nitric acid, sulfur dioxide, and sulfate (PM2.5) fluxes over soybeans using the modified Bowen-ratio method. **L. Myles**, J. Kochendorfer, M. W. Heuer, T. P. Meyers

Catfish Aquaculture: Producing a Safe, Delicious and Nutritious Food for Consumers.

68. Food defense activities for production of catfish products. **S. P. Reddy**, K. Green

Application of Natural Products in Organic Farming.

69. Evaluation of a new natural product herbicide for rice weed control. **M. E. Koivunen**, R. N. Asolkar, H. Huang, S. Shu, C. Morgan, A. L. Cordova-Kreylos, S. Navarro, P. G. Marrone

Agrochemical Residue and Metabolism Chemistry.

70. Diversity of herbicide transformation-product concentrations in the Shenandoah River watershed indicates differences in microbial and geological influences in basins surrounding streams. **T. B. Huff**, J. Liu, G. D. Foster

71. Development of quantitative LC/MS/MS method for glyphosate residue analysis. G. S. Moorthy, K. L'Empereur, **A. B. Orth**, J. E. Eble

72. Effect of olive-mill waste addition to soil on sorption, persistence, and leaching of the herbicide fluometuron. B. Gamiz, R. Celis, **L. Cox**, J. Cornejo, W. C. Koskinen

73. Physiological and yield response of transgenic and nontransgenic corn to glyphosate. **K. N. Reddy**, N. Bellaloui, R. M. Zablotowicz

74. Use of DNA adduct biomarkers as measures of susceptibility of vegetable plants to oxidative and genotoxic stress from pesticides. **D. W. Boerth**, E. Eder, T. C. Andrade, P. Wanek

75. Validation of an analytical method for the determination of N-nitrosoglyphosate in glyphosate formulations by high performance liquid chromatography with tandem mass spectrometry detection. **F. A. Claussen**

AGRO Education Awards for Undergraduate and Graduate Student Travel

Research Poster Presentations

76. A green chemistry approach to targeting *Periplaneta americana's* octopamine receptor 1. **A. D. Gross**, M. J. Kimber, P. Ribeiro, J. R. Coats

77. Uptake and degradation of atrazine in switchgrass (*Panicum virgatum*). **I. J. Murphy**, J. Anderson, J. R. Coats

78. Biochemical and toxicological assessment of newly designed insect acetylcholinesterase inhibitors against mosquito vectors and agricultural pests. **D. R. Swale**, P. R. Carlier, J. Hartsell, M. Ma, J. R. Bloomquist

79. Ciprofloxacin degradation by membrane anodic Fenton treatment. **X. Xiao**, A. T. Lemley

80. Clay-based formulations to reduce the environmental impact of the herbicide terbuthylazine. **C. Trigo**, W. C. Koskinen, R. Celis, J. Cornejo

81. Computational approaches elucidate how a glycine deletion enables plant protoporphyrinogen oxidase to resist herbicides. **P. R. Daga**, F. E. Dayan, S. O. Duke, R. M. Lee, P. J. Tranel, R. J. Doerksen

82. DDA in chickens, a pilot study as a DDT biomarker. **Z. Chen**, O. Unoje, L. Cui, K. Aratani, R. I. Krieger

83. Determination of pesticide degradation in raw and processed foods. **S. M. Adkins**, P. B. Ryan

84. Development of analytical techniques for the detection and quantification of erythromycin in environmental matrices. **A. M. Jessick**, T. B. Moorman, J. R. Coats

85. Effects of monoterpenoids on $^{36}Cl^{-}$ uptake of central nerve cords in the American cockroach. **F. Tong**, J. R. Coats

86. Highly selective carbamates for Anopheles gambiae acetylcholinesterase: Effects of pharmacokinetics on toxicity to mosquitoes. **J. M. Mutunga**, J. Hartsel, M. Ma, L. Srigiriraju, D. M. Wong, B. T. Jackson, **T. D. Anderson**, S. L. Paulson, P. R. Carlier, J. R. Bloomquist

87. Induction and characterization of ion channels in Sf21 cells. **L. J. Jenson**, S. L. Paulson, J. R. Bloomquist

88. Reducing near-field agricultural fumigant emissions through changes in regional application practices. **M. H. Littke**, J. LePage, V. Hebert

89. Tannin determination in tamarisk and other foliage. **A. M. Hussey**, B. A. Kimball

90. Transport, distribution, and interaction of pesticides, nutrients, and select pathogens in the Choptank River. **G. T. Nino de Guzman**, C. J. Hapeman, A. Torrents, K. L. Brubaker

New Developments and Issues in Agrochemical Science .

91. Comparison of furfural to common soil fumigants and other liquid nematicides in relation to their toxicity, ecological toxicity, and environmental fate. **M. T. Reynolds**, N. Cowen, J. Wagar, N. Becker, A. C. Katz, G. J. Burger

92. Development of guidance for evaluating and calculating degradation kinetics in environmental media. **W. P. Eckel**, D. S. Spatz, R. D. Jones, D. Young, M. Shamim, L. Avon, I. Kennedy, A. McCoy, S. Kirby, G. Malis, R. Mathew

93. Development of mosquito-selective acetylcholinesterase inhibitors to control the malaria vector, *Anopheles gambiae*: Comparative sequence and structure approach. **D. M. Wong**, P. R. Carlier, P. C -H. Lam, M. M. Totrov, J. R. Bloomquist

94. Interactions of the herbicide quinclorac with a bioherbicidal strain of *Myrothecium verrucaria*. **R. E. Hoagland**, C. D. Boyette, K. C. Vaughn

95. Long-term studies of preformed organophosphorous insecticide biomarkers in produce. Y. Li, Z. Chen, M. M. Bigelow Dyk, A. Higa, T. Lopez, H. Vega, **R. I. Krieger**

96. Toxicity of pyriproxyfen, a juvenile hormone mimic, against Asian citrus psyllid, *Diaphorina citri*. **D. R. Boina**, L. Stelinski

97. Vibration spectroscopy of polyoxometalates and intermediates, applied as agents against plant viruses. **S. Uskokovic-Markovic**, I. Holclajtner-Antunovic, D. Bajuk-Bogdanovic

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Government Collaborations in Scientific Research, Regulations, and Communications
Cosponsored by COMSCI and GLOBAL
J. M. Van Emon, *Organizer*

Section D
Renaissance Washington -- Grand Ballroom Central

10:15 — Introductory Remarks.

10:20 —98. NIST's roles in providing measurements and standards in chemistry through collaborations with government, industry, and academia. **S. A. Wise**

10:40 —99. EPA's lead, renovation, repair, and painting program: Final rule. **D. Utterback**, S. Harper, K. R. Rogers, J. M. Van Emon, M. Medina-Vera

11:00 —100. Advancing partnerships to combat climate change. **S. Wickwire**

11:20 —101. Environmental technology verification: Benefits of collaboration. **J. L. McKernan**, A. Dindal

11:40 —102. An industry perspective on collaborative projects on pesticides involving government, academic, and industry scientists. **I. D. Kelly**

MONDAY AFTERNOON

International Award for Research in Agrochemicals: Don Wauchope and Friends: Reflections on the Future of Pesticide Environmental Chemistry
Cosponsored by GLOBAL
A. S. Felsot, *Organizer*

Section A
Renaissance Washington -- Auditorium

Agrochemical Properties: Runoff
1:55 — Introductory Remarks.

2:00 —103. Hierarchical approach for obtaining values of physical and chemical parameters controlling the transport and fate of pesticides and their transformation products in the hydrologic system. **J. E. Barbash**, P. D. Capel, T. C. Hancock, K. C. Rice

2:30 —104. FOOTPRINT Pesticide Properties Database: Why and how it was developed and its future role in environmental risk assessments. **K. A. Lewis**

3:00 — Coffee Break.

3:15 —105. What drives pesticide runoff: An empirical journey to a framework for pesticide runoff using some of Don's ideas. **D. M. Silburn**

3:45 —106. Simulation models, macropores, tillage, and rainfall intensity role in pesticide transport through soil. **R. Malone**, M. Shipitalo, L. Ma, R. D. Wauchope, L. Ahuja, G. Fox, G. J. Sabbagh, S. Logsdon

4:15 —107. Field run-off and buffer performance testing: An historic tour of studies, breakthroughs, and technical contributors. **P. N. Coody**

Lawrence A. Burns Memorial Symposium on Advances in Environmental Modeling of Pesticides
Cosponsored by ENVR and GLOBAL
T. S. Ramanarayanan and R. D. Parker, *Organizers*

Section B
Renaissance Washington -- Renaissance West A

1:15 — Introductory Remarks.

1:25 —108. A new PRZM algorithm for predicting biphasic degradation of pesticide in soil using coupled time-dependent sorption and degradation kinetics: Model theory and conceptualization. **W. Chen**, M. Cheplick

1:45 —109. Incorporating effect of vegetative filter strip in pesticide aquatic exposure assessment. **G. J. Sabbagh**, G. Fox, R. Munoz-Carpena, M. Lenz

2:05 —110. Modeling pesticide total residues of toxicological concern. **M. Ruhman**, J. Hetrick, R. D. Jones

2:25 —111. Comparison of aquatic exposure assessment models for pesticide use on rice. **A. M. Ritter**, W. M. Williams, J. Tang, T. S. Ramanarayanan, D. Desmarteau, S. Anderson

2:45 —112. Cumulative tracking of pesticide drift in New Zealand. **A. J. Hewitt**, R. J. Connell, J. A. Zabkiewicz, E. Post

3:05 — Coffee Break.

3:20 —113. Development and application of a minimal calibration approach for watershed-scale modeling of pesticides with SWAT. **M. F. Winchell**, R. Srinivasan, N. Peranginangin

3:40 —114. Lessons learned from an exercise to evaluate watershed-scale pesticide fate and transport models. **M. Barrett**, R. D. Parker

4:00 —115. PRZM version 4.2 calibration, geospatial extrapolation, and model output query tool. **T. L. Estes**, W. Chen, M. F. Winchell, B. Patterson, A. M. Wadley, C. Dharmasri

4:20 —116. Is the U.S. Environmental Protection Agency's pesticide aquatic risk assessment process protective? **W. M. Williams**, P. Hendley, S. H. Jackson, A. M. Ritter, J. M. Cheplick, C. M. Holmes

Solvents in Aquatic Toxicology Testing
Cosponsored by GLOBAL
J. Green and S. R. Mortensen, *Organizers*

Section C
Renaissance Washington -- Grand Ballroom South

1:30 — Introductory Remarks.

1:40 —117. Solvents as practical tools in laboratory aquatic toxicity testing. **L. Sayers**, M. Cafarella, J. Green, S. R. Mortensen, J. Wheeler, K. Henry

2:10 —118. Dimethyl formamide (DMF) as a vehicle for delivery of test substances in aquatic toxicology testing. **T. A. Springer**

2:40 —119. USEPA's Office of Pesticide Programs guidance for evaluating aquatic toxicology studies using dilution water and solvent controls. **T. A. Bailey**, C. S. Hartless, D. M. Randall, K. G. Sappington, M. J. Frankenberry

3:10 — Coffee Break.

3:25 —120. Statistical issues in the use of solvents in aquatic toxicology experiments. **J. W. Green**

3:55 —121. Revisiting statistical hypothesis testing. **M. C. Newman**

4:25 —122. Discussion and final thoughts from the solvents in aquatic toxicology testing symposium. **S. R. Mortensen**, J. W. Green

Government Collaborations in Scientific Research, Regulations, and Communications
Cosponsored by COMSCI and GLOBAL
J. M. Van Emon, *Organizer*

Section D
Renaissance Washington -- Grand Ballroom Central

1:25 — Introductory Remarks.

1:30 —123. Overview of EPA's Sector Strategies Program and its work with the chemical industry. R. S. Benson, **J. Gilbreath**

1:50 —124. Media training for scientists. **R. Hayes**

3:20 — Coffee Break.

3:35 —125. The success of green chemistry collaborations. **R. E. Engler**

3:55 —126. The Global Innovation Imperatives. **F. Gomez**

4:15 — Panel Discussion.

MONDAY EVENING
Sci-Mix
E. L. Arthur, *Organizer*

Section A
Walter E. Washington Convention Center -- Hall D
8:00 - 10:00

53, 55, 58, 64-70, 74-79, 81-87, 89-92, 94. See previous listings.

TUESDAY MORNING

International Award for Research in Agrochemicals: Don Wauchope and Friends: Reflections on the Future of Pesticide Environmental Chemistry
Cosponsored by GLOBAL
A. S. Felsot, *Organizer*

Section A
Renaissance Washington -- Auditorium

Agrochemical Leaching & Modeling
8:25 — Introductory Remarks.

8:30 —127. Review of pesticide ground water issues and research. **R. L. Jones**

9:00 —128. Current and future role of adsorption studies in pesticide leaching assessment for nonstructured soils. **J. Boesten**, W. Beltman

9:30 —129. Modelers getting real: Linking conceptual models, algorithms, and monitoring data. **P. Hendley**

10:00 — Coffee Break.

10:15 —130. Improving model performance through model parameterization. **Q. Ma**, S. Cohen

10:45 —131. Modeling heterogeneous environmental systems: Evolving data needs. **E. Behl**

11:15 —132. Modeling pesticide risks: Start with groundwater, go to turf, and keep going. **S. Z. Cohen**

Agricultural Research in Australia: Critical Issues Leading up to the 12th IUPAC International Congress on Pesticide Chemistry in Melbourne
Cosponsored by GLOBAL
K. D. Racke, *Organizer*
L. L. McConnell and R. Hill, *Organizers, Presiding*

Section B
Renaissance Washington -- Renaissance West A

10:15 —133. The Melbourne 2010 IUPAC Congress on Pesticide Chemistry: An introduction. **G. Simpson**

10:30 —134. Australia and the emerging bioeconomy. **C. J. F. Begley**, D. D. O'Connell, D. M. Hirsch, D. P. East, D. D. Robson

11:00 —135. Pest population dynamics: Changing climate, agricultural landscapes, and pesticide usage in Australia. **M. P. Zalucki**

11:30 —136. Breeding improved crop cultivars for water-scarce environments. R. A. Richards, **R. J. Hill**

Challenges and Initiatives in Harmonizing Maximum Residue Levels (MRLs) Across the World
Cosponsored by GLOBAL
C. J. Peterson and J. F. Sandahl, *Organizers*
K. D. Racke and J. Callahan, *Organizers, Presiding*

Section C
Renaissance Washington -- Grand Ballroom South

8:30 — Introductory Remarks.

8:40 —137. MRL harmonization in the NAFTA region: A grower's perspective. **D. A. Botts**

9:05 —138. Challenges for California specialty crops: MRLs as critical issues for export markets. **L. A. Berger**

9:30 —139. Global MRL harmonization: Pipe-dream or reality? **P. A. Brindle**

9:55 — Coffee Break.

10:10 —140. Challenges in horticultural trade for Kenya: An international perspective from a developing country. **L. M. Namu**

10:35 —141. Lessons from the EU MRL harmonization: How feasible is global MRL harmonization? **F. Rosseneu**

11:00 —142. Impact of maximum residue levels on international trade. **G. Storey**

11:25 —143. Harmonizing international pesticide residues: A consumer perspective. **M. Hansen**

11:50 — Concluding Remarks.

Advances in Biofuels and Bioproducts: Life Cycle Analysis and Sustainability
LCA Challenges
Cosponsored by GLOBAL
C. J. Hapeman and J. N. Seiber, *Organizers*
J. H. Massey and L. Schwartz, *Organizers, Presiding*

Section D
Renaissance Washington -- Grand Ballroom Central

8:10 — Introductory Remarks.

8:15 —144. Developing the renewable fuel standard: Life cycle greenhouse gas emissions. **R. Larson**

8:45 —145. Economies and carbon burdens of renewable fuels. **R. C. Brown**, J. Gifford

9:15 —146. Life cycle emissions standards for biofuels: Transparency, representativeness, and uncertainties. **A. J. Liska**

9:45 — Coffee Break.

10:00 —147. Extending life cycle assessment to include infrastructure required for a mature biofuels industry. **W. M. Griffin**, H. S. Matthews

10:30 —148. Life cycle assessment of ethanol in 2022. **D. D. Hsu**, G. Heath, D. Inman, A. Aden, M. K. Mann

11:00 — Discussion: Where do we go from Here?

Sterling B. Hendricks Memorial Lectureship

Sponsored by
USDA Agricultural Research Service
Cosponsored by AGFD, and GLOBAL
M. H. Tunick and K. Kaplan, *Organizers*
S. O. Duke, *Organizer, Presiding*

Section E
Renaissance Washington -- Grand Ballroom Central

11:30 — Award Presentation. **Dr. Edward Knipling**.

11:45 —149. Award Address (Sterling Hendricks Memorial Lecture, sponsored by USDA Agricultural Research Service). Biomanufacture of nanoparticle vaccines in plants. **C. Arntzen**

12:45 — Reception.

TUESDAY AFTERNOON

International Award for Research in Agrochemicals: Don Wauchope and Friends: Reflections on the Future of Pesticide Environmental Chemistry
Cosponsored by GLOBAL
A. S. Felsot, *Organizer*

Section A
Renaissance Washington -- Auditorium

Bioavailability: Fate
1:55 — Introductory Remarks.

2:00 —150. Characterization of pesticide availability/bioavailability in soils. **W. C. Koskinen**

2:30 —151. Seeking the bridge between environmental chemistry and toxicology: Is there a relationship between physicochemical properties and body dose? **A. S. Felsot**

3:00 — Coffee Break.

3:15 —152. Pesticide characteristics important to predicting volatile loss from foliar surfaces. **J. J. Jenkins**

3:45 —153. Pesticides in air: The evolving nature of agriculture air quality research. **L. L. McConnell**

4:15 —154. Pesticide environmental fate research for the 21st century: Building bridges between laboratory and field studies at varying scales. **T. L. Potter**

Agricultural Research in Australia: Critical Issues Leading up to the 12th IUPAC International Congress on Pesticide Chemistry in Melbourne
Cosponsored by GLOBAL
R. Hill and L. L. McConnell, *Organizer*
G. Simpson, *Presidin*
K. D. Racke, *Organizer, Presiding*

Section B
Renaissance Washington -- Renaissance West A

1:30 —155. Genome of the cotton bollworm, Helicoverpa armigera. **K. H. J. Gordon**

2:00 —156. Small molecule ligand discovery in Australia. **T. O'Meara**, T. Adams, G. Lovrecz, O. Dolezal, J. Newman, T. Peat, J. Ryan

2:30 —157. Food residues and trade implications of insecticides used for post-harvest grain protection. **K. D. Racke**, M. B. Hertlein, P. Hughes

3:00 — Coffee Break.

3:15 —158. Ecdysone receptors as targets for the discovery of environmentally-friendly insecticides. **R. J. Hill**, L. Graham, G. Hannan, A. Pawlak-Skrzecz, L. Noyce, D. Tohidi-Esfahani, M. Pollard, L. Howell, R. Fernely, G. Lovrecz, L. Lu, T. Phan, J. Carmichael, P. Pat, W. Johnson, M. Bliese, K. Turner, V. Streltsov, T. Peat, T. O'Meara, D. Winkler, M. Lawrence

3:45 —159. Isoxazoline insecticides. **G. P. Lahm**, T. F. Pahutski, J. K. Long, B. K. Smith, M. Xu, C. W. Holyoke Jr., J. D. Barry, D. Cordova, R. Smith

4:15 —160. Novel technologies for effective control of resistant insect pests. **R. V. Gunning**

Challenges and Initiatives in Harmonizing Maximum Residue Levels (MRLs) Across the World
Cosponsored by GLOBAL
K. D. Racke and J. Callahan, *Organizers*
J. F. Sandahl and C. J. Peterson, *Organizers, Presiding*

Section C
Renaissance Washington -- Grand Ballroom South

1:25 — Introductory Remarks.

1:30 —161. Role of databases in international MRL harmonization activities: Past experience and future developments. **S.E. Nielsen**

1:55 —162. Harmonization efforts through global joint reviews of new pesticide active ingredients. **L. Rossi**

2:20 —163. Efforts in residue chemistry harmonization: A crop protection industry perspective. **V. Bornemann**

2:45 —164. Global minor use activities and progress. **D. L. Kunkel**, J. Baron, M. Braverman, B. Barney, J. Corley, V. Starner

3:10 — Coffee Break.

3:25 —165. OECD harmonized MRL calculator. J. M. Stewart, **P. S. Villanueva**

3:55 —166. Proposed approach for global residue programs. **C. Tiu**, K. D. Racke

4:20 —167. Chlorantraniliprole: A case study in global MRL harmonization. **J. C. Ruhl**, K. M. Jernberg, M. D. Woodward

4:45 —168. Can MRLs be harmonized globally? **A. W. Chen**

5:10 — Concluding Remarks.

Advances in Biofuels and Bioproducts: Life Cycle Analysis and Sustainability Addressing Sustainability
Cosponsored by GLOBAL
C. J. Hapeman and J. N. Seiber, *Organizers*
L. Schwartz and J. H. Massey, *Organizers, Presiding*

Section D
Renaissance Washington -- Grand Ballroom Central

2:00 —169. Using exergy to assess sustainability of biofuels. **K. J. Ptasinski**

2:25 —170. Bioenergy and sustainability forestry. **M. Patton-Mallory**, M. A. Buford

2:50 —171. Advancing biofuels: Balancing for sustainability. **J. M. F. Johnson**, D. L. Karlen

3:15 — Coffee Break.

3:30 —172. From waste biomass to valuable bioproducts: An E^3 (energy, environmental, economic) profit strategy. **W. Zheng**, N. Rajagopalan, M. Guo

3:55 —173. Developing sustainable strategies for biodiesel synthesis using high fatty acid feedstock. **H. L. Ngo**, N. A. Zafiropoulos, T. A. Foglia, E. T. Samulski, W. Lin

4:20 —174. Co-encapsulated glucose isomerase and yeast as cost-efficient biocatalyst for biofuel production from hemicellulose hydrolysate. B. Frederick, **M. Ornatska**, P. Christiansen, S. Andreescu

4:45 — Concluding Remarks.

WEDNESDAY MORNING

International Award for Research in Agrochemicals: Don Wauchope and Friends: Reflections on the Future of Pesticide Environmental Chemistry
Cosponsored by GLOBAL
A. S. Felsot, *Organizer*

Section A
Renaissance Washington -- Auditorium

Fate & Exposure Assessment
8:25 — Introductory Remarks.

8:30 —175. Pesticide environmental fate from the microbial to the international levels. **K. D. Racke**

9:00 —176. Terrestrial field dissipation study: A research tool for elucidating pesticide environmental fate. **A. C. Barefoot**

9:30 —177. Past, current, and future environmental risk evaluations in the Netherlands and the European Union. **J. Linders**

10:00 — Coffee Break.

10:15 —178. Regulatory modeling for pesticide aquatic exposure assessment. **R. D. Parker**

10:45 —179. Investigating riparian buffers impact on pesticide fate using the Riparian Ecosystem Management Model. **R. G. Williams**, R. Lowrance, R. D. Wauchope, T. L. Estes

11:15 —180. Water quality metrics for tracking sustainability of cropping systems. **D. I. Gustafson**, J. W. Frey, M. D. Matlock, R. Stewart, R. L. Jones, P. Hendley, S. H. Jackson, M. H. Russell

Managing Agricultural Gas and Particle Emissions
Cosponsored by GLOBAL
C. J. Hapeman, L. L. McConnell, S. L. Trabue, and A. S. Gunasekara, *Organizers*
S. R. Yates, *Organizer, Presiding*

Section B
Renaissance Washington -- Renaissance West A

Collection and Quantitation
8:15 — Introductory Remarks.

8:25 —181. USDA-ARS research programs address scientific knowledge gaps in air quality and provide sound mitigation strategies. **C. L. Walthall**

8:45 —182. Identifying key odorants off-site from animal feeding operations. **S. L. Trabue**, L. L. McConnell, R. G. Maghirang, T. Sauer

9:05 —183. Chemical and olfactometric analyses of malodors associated with land application of biosolids. **Y. Laor**, M. Naor, U. Ravid, P. Fine, I. Halachmi, Y. Chen

9:25 —184. Measuring volatile reduced sulfur compounds from swine houses by gas chromatograph with amperometric sulfur detector (GC-ASD). **M. J. Hansen**, A. P. S. Adamsen, A. Feilberg, K. Jonassen

9:45 — Coffee Break.

10:00 —185. Development of a novel and sensitive thermal desorption method for the determination of key odorants from animal feeding operations. **L. Cai**, S. Zhang, J. A. Koziel, L. Jacobson, A. Heber, D. B. Parker, N. Akendiz, S. Bereznicki

10:20 —186. Downwind odor sampling strategies for transient events utilizing combined metalized-FEP gas sampling bags, sorbent tube transfer and thermal reconstitution. **D. W. Wright**, F. Kuhrt, D. K. Eaton, J. A. Koziel

10:40 —187. Quantification of odorant emissions from swine houses by proton-transfer-reaction mass spectrometry (PTR-MS). **A. Feilberg**, A. P. S. Adamsen, M. J. Hansen

11:00 —188. Evaluation of EPA approved FRM PM10 samplers. **M. K. Thelen**, W. B. Faulkner, B. W. Shaw, R. E. Lacey

11:20 —189. Stripping of herbicides from atmospheric particulates during high-volume air sampling. **A. J. Cessna**, D. Waite, J. Bailey, L. A. Kerr

Exposure to Chemicals in Urban Aquatic Environments
Cosponsored by GLOBAL
S. H. Jackson and J. H. Massey, *Organizers*
P. Hendley, *Organizer, Presiding*

Section C
Renaissance Washington -- Grand Ballroom South

8:15 — Introductory Remarks.

8:20 —190. Runoff transport of pyrethroids from a residential lawn in central California. **J. Hanzas**, R. L. Jones, J. White

8:40 —191. Monitoring pesticides in urban stormdrain and surface waters in four metropolitan areas of California. **L -M. He**, M. Ensminger, K. Kelley, F. Spurlock, K. Goh

9:00 —192. Washoff/runoff of cypermethrin residues from slabs of external building material surfaces using simulated rainfall. **J. R. Trask**, C. M. Harbourt, R. L. Jones, M. Cox, C. Lam, L. Zwilling

9:20 —193. Pollutants in runoff from residential sources. **L. Oki**, D. L. Haver, S. Bondarenko, A. Manfree, M. L. Flint, S. E. Greco, A. Bale, M. V. Yates, J. Gan

9:40 —194. Pesticide detections in residential irrigation runoff. **D. L. Haver**, L. Oki, S. Bondarenko, L. Dodge, E. Lee, T. Majcherek, J. N. Kabashima, J. Gan

10:00 — Coffee Break.

10:15 —195. Pyrethroid partitioning between water and suspended sediments in urban and agricultural creeks. **M. L. Hladik**, K. Kuivila

10:35 —196. Transport of insecticides to urban streams: Conceptual models and perceptions. **P. Hendley**, R. L. Jones, M. G. Dobbs

10:55 — Discussion.

Non-dietary Human Exposure and Risk Assessment
Regulatory Issues
Cosponsored by GLOBAL
M. E. Krolski and C. Lunchick, *Organizers*

Section D
Renaissance Washington -- Grand Ballroom Central

8:00 — Introductory Remarks.

8:10 —197. Scientific and ethical reviews of exposure assessment methods. **J. Dawson**

8:40 —198. Establishment of the Human Studies Review Board (HSRB). **E. B. Gordon**

9:10 —199. Impact of Human Studies Review Board on agricultural worker exposure studies. **L. Rosenheck**

9:40 —200. Comparison of deterministic and probabilistic approaches to estimating pesticide handler exposures. **D. G. Baugher**

10:10 — Coffee Break.

10:25 —201. Experimental design of AHETF exposure monitoring studies. **L. R. Holden**, D. G. Baugher

10:55 —202. Effect of changes in human exposure regulations on quality assurance audits. **R. Fuller**

11:25 — Discussion.

11:55 — Concluding Remarks.

WEDNESDAY AFTERNOON

Advancements in Geospatial Risk Assessment and Techniques
Cosponsored by GLOBAL
G. G. Hoogeweg, *Organizer*

Section A
Renaissance Washington -- Auditorium

1:30 —203. Geospatial risk assessment for agrochemicals: An abridged history. **G. G. Hoogeweg**, C. M. Holmes

2:00 —204. Using GIS for spatial modeling in ecological risk assessment of agrochemicals at the catchment-scale in Australia. **M. Burns**, A. N. Crossan, G. G. Hoogeweg, A. C. Barefoot, I. R. Kennedy

2:30 —205. Framework for estimating exposure of ESA-listed salmon to pesticides. **S. P. Cramer**, N. Poletika, R. Everich, M. Schocken, C. Habig, R. Reiss

3:00 — Coffee Break.

3:30 —206. Development of spatially explicit model inputs for evaluating ecological impacts to streams in Ohio. **C. M. Holmes**, B. S. Lee, S. D. Dyer, C. E. White-Hull, K. E. Kapo, A. Burton, L. Posthuma, D. de Zwart, C. Mulder

4:00 —207. National scale modeling framework design for probabilistic agrichemical risk assessment. **P. Miller**, L. Zwilling, J. M. Cheplick, C. M. Harbourt, J. J. Prenger, D. Mao

Managing Agricultural Gas and Particle Emissions
Cosponsored by GLOBAL
L. L. McConnell, S. R. Yates, C. J. Hapeman, and S. L. Trabue, *Organizers*
A. S. Gunasekara, *Organizer, Presiding*

Section B
Renaissance Washington -- Renaissance West A

Measuring and Modeling Emissions
1:30 —208. Outlook on EU guidance on emissions of plant protection products (PPP) to air. **M. Egsmose**, S. K. Bopp

1:50 —209. Computational fluid dynamics investigation of methods to measure emissions from natural ventilated livestock buildings. **B. Bjerg**, G -Q. Zhang

2:10 —210. Monthly, seasonal. and annual ammonia emissions from southern High Plains cattle feedyards. **R. W. Todd**, N. A. Cole, M. B. Rhoades, D. B. Parker

2:30 —211. Model assessment of fumigant emissions. **D. Wang**, S. Yates

2:50 —212. Review of design issues for on-field flux assessment methods. **D. A. Sullivan**

3:10 — Coffee Break.

3:25 —213. Modeling approaches for quantifying emissions from commodity treatments. **J. L. Dawson**

3:45 —214. Direct measurements of the ozone formation potential from agricultural animal source emissions using a transportable smog chamber. **C. J. Howard**, A. Kumar, W. Yang, P. G. Green, F. M. Mitloehner, I. Malkina, R. Flocchini, M. J. Kleeman

4:05 —215. Determination of VOC emissions and ozone formation from spraying solvent-based pesticides in the San Joaquin Valley of California. **A. Kumar**, C. J. Howard, D. Derrick, M. J. Kleeman, P. G. Green

4:25 —216. Low volatility solvents and oil pesticides and their ozone formation potential. **D. Derrick**, P. G. Green, A. Kumar

4:45 —217. Effect of meteorology and soil condition on metolachlor and atrazine volatilization. **T. Gish**, J. Prueger, J. Hatfield, L. McKee, W. Kustas, C. Daughtry, A. Russ

Exposure to Chemicals in Urban Aquatic Environments
Cosponsored by GLOBAL
S. H. Jackson and P. Hendley, *Organizers*
J. H. Massey, *Organizer, Presiding*

Section C
Renaissance Washington -- Grand Ballroom South

1:15 — Introductory Remarks.

1:20 —218. Foliar fungicide occurrence in urban and agricultural streams. **J. R. Vogel**, M. Sandstrom, S. H. Jackson

1:40 —219. Golf turf pesticide runoff losses from four regional sites. **M. J. Carroll**, J. H. Massey, P. J. Rice, G. E. Bell, M. Nett

2:00 —220. Reducing the environmental impact of urban runoff: Use of management practices to mitigate pesticide and nutrient transport with runoff from fairway turf. **P. J. Rice**, B. P. Horgan, J. L. Rittenhouse

2:20 —221. Use of a storm water management model for diagnosis of residential exposure issues. **S. H. Jackson**, M. F. Winchell

2:40 —222. Urban BMPs can protect water quality: Non-pesticides as models for pesticides. **S. Z. Cohen**

3:00 — Coffee Break.

3:20 —223. Organic wastewater compounds in combined sewer overflows, stormwater, and receiving streams in Omaha, Nebraska. **J. R. Vogel**, J. D. Frankforter, D. L. Rus

3:40 — Discussion.

4:10 — Concluding Remarks.

Non-dietary Human Exposure and Risk Assessment
Study Design
Cosponsored by GLOBAL
M. E. Krolski and C. Lunchick, *Organizers*
Section D

Renaissance Washington -- Grand Ballroom Central

1:15 — Introductory Remarks.

1:25 —224. Refinements of AHETF study design criteria and volunteer recruitment procedures utilized by AHETF for populating a generic handler exposure database pursuant to HSRB reviews. **V. Canez**, D. E. Barnekow

1:55 —225. Design of an observational worker exposure study in commercial seed treatment facilities. **M. E. Krolski**, C. Lunchick, J. Panara

2:25 —226. Transfer of flea control insecticides in collars or spot-on treatments from pet dogs to people. **J. E. Chambers**, M. K. Davis

2:55 — Coffee Break.

3:25 —227. Updating standard operating procedures for residential exposure assessment. **M. Crowley**

3:55 —228. Efforts toward the development of risk assessment guidelines for use by regulatory agencies in Brazil. **T. A. Joseph**, A. C. de Aguirre, H. Bertochi, I. V. K. S. França, S. S. Palma, S. C. Takaki-Schmidt, R. M. de Sá Trevisan

4:25 — Discussion.

4:55 — Concluding Remarks.

THURSDAY MORNING

Monitoring and Modeling Atrazine Ecological Exposure Potential
Cosponsored by GLOBAL
P. Hendley, *Organizer*

Section A
Renaissance Washington -- Auditorium

8:30 — Introductory Remarks.

8:35 —229. Atrazine ecological exposure monitoring program: Study design and conduct. **C. M. Harbourt**, L. S. Carver, P. Hendley, N. J. Snyder, J. R. Trask, P. Miller, E. Johnston, S. Chen

8:55 —230. Modeling community-level responses to atrazine in Midwestern streams. **S. M. Bartell**, S. K. Nair, D. C. Volz

9:15 —231. Identifying watersheds that potentially exceed effects-based atrazine thresholds from a multiyear monitoring study. **N. Thurman**, M. Corbin, M. Thawley, M. G. Frankenberry, S. Irene

9:35 —232. Agrochemical surface water monitoring: Interpreting results from the atrazine ecological exposure monitoring study. **P. Hendley**, C. M. Harbourt, P. Miller, J. J. Prenger, D. Volz

9:55 — Coffee Break.

10:10 —233. Hybrid PRZM: Combining high frequency field sampling data and simulation modeling. P. Miller, **C. M. Harbourt**, N. J. Snyder, P. Hendley, J. J. Prenger

10:30 —234. Determining the depth to a restrictive or claypan layer: National assessment at the field scale. **P. Miller**, J. J. Prenger, C. M. Harbourt, P. Hendley

10:50 —235. National SSURGO based PRZM modeling: Comparative exposure potential. **P. Miller**, J. M. Cheplick, J. J. Prenger, L. Zwilling, D. Mao, C. M. Harbourt

11:10 —236. Visualization challenges in high resolution spatial assessments. **C. M. Holmes**, P. Miller, D. Mao, J. Amos, J. J. Prenger, C. M. Harbourt

Managing Agricultural Gas and Particle Emissions
Cosponsored by GLOBAL
L. L. McConnell, C. J. Hapeman, S. R. Yates, and A. S. Gunasekara, Organizers
S. L. Trabue, Organizer, Presiding

Section B
Renaissance Washington -- Renaissance West A

Measuring and Mitigating Emissions
9:00 —237. Ammonia volatilization from broiler litter. **P. Moore Jr.**, D. Miles, R. Burns, D. Pote, W. Berg, I. Choi

9:20 —238. Effect of dietary methionine and benzoic acid on emission of volatile sulphur compounds, ammonia, and methane from stored pig slurry. **A. P. S. Adamsen**, J. Eriksen, J. V. Nørgaard, H. D. Poulsen

9:40 —239. Effects of chemical treatment of slurry with ozone and sulfuric acid on gas emission from fattening units. **K. E. N. Jonassen**, M. Lyngbye, K. Sørensen, C. Christophersen

10:00 — Coffee Break.

10:20 —240. Factors which influence emissions of soil fumigants. **C. Smith**

10:40 —241. Plastic films for soil fumigation: Permeability and emissions reduction. **S. Papiernik**, S. Yates

11:00 —242. Increasing efficacy and decreasing the application rate of Telone C35 with carbon dioxide. **J. E. Thomas**, L -T. Ou, D. W. Dickson, L. H. Allen Jr., J. C. Vu

11:20 —243. Development of practices for minimizing emissions from soil fumigation using field plot tests. **S. Gao**, R. Qin, B. Hanson, D. Wang, S. Yates

11:40 —244. Emissions of 1,3-D and chloropicrin from a single soil under a range of application and emission reduction strategies. **D. Ashworth**, F. Ernst, L. Luo, R. Xuan, S. Yates

Catfish Aquaculture: Producing Safe, Delicious and Nutritious Food
Cosponsored by AGFD and GLOBAL
K. L. Armbrust and J. Johnston, Organizers, Presiding

Section C
Renaissance Washington -- Grand Ballroom South

9:00 — Introductory Remarks.

9:05 —245. US catfish industry: From pond to plate. **D. Rouse**, J. Chappell, T. Hanson, J. Jensen

9:25 —246. Environmental sustainability of channel catfish aquaculture. **C. S. Tucker**

9:45 —247. Review of hybrid catfish research at the National Warmwater Aquaculture Center. **B. Bosworth**

10:05 — Coffee Break.

10:20 —248. Observed differences in fatty acid profiles for commercially produced channel catfish from Mississippi. **R. S. Stahl**, S. Barras, B. Dorr

10:40 —249. The catfish farmers of America: Challenges facing the industry. **R. E. Barlow**

11:00 —250. A comparison of production systems of Vietnamese basa/tra and Chinese catfish with U.S. farm-raised catfish with implications for health and safety. **C. R. Engle**

11:20 —251. Development of the Food Safety and Inspection Service's catfish inspection program. **C. M. Schroeder**

11:40 —252. Catfish risk assessment for development of science based regulatory policies. **J. J. Johnston**, J. Lee, D. D. LaBarre, C. Guo, C. Schroeder, J. R. Kause

Non-dietary Human Exposure and Risk Assessment Methodology
Cosponsored by GLOBAL
M. E. Krolski and C. Lunchick, Organizers

Section D
Renaissance Washington -- Grand Ballroom Central

8:15 — Introductory Remarks.

8:25 —253. Exposure to pesticides in greenhouses: A new modeling approach in Europe. **H. Wicke**

8:55 —254. Greenhouse dissipation of dislodgeable foliar residues of furfural following applications to smooth and hairy leaf ornamentals. **M. F. Kovacs Jr.**, E. Shepard, T. Wilson, G. J. Burger, J. Hensley, A. C. Katz

9:25 —255. Analytical methodology for an observational worker exposure study in commercial seed treatment facilities involving multiple target compounds. **I. M. Murphy**

9:55 — Coffee Break.

10:10 —256. Validation of analytical methods for the determination of glyphosate in worker exposure matrices by high performance liquid chromatography-tandem mass spectrometry. **H. D. Scobell**

10:40 — Discussion.

11:25 — Concluding Remarks.

THURSDAY AFTERNOON

Monitoring and Modeling Atrazine Ecological Exposure Potential
Cosponsored by GLOBAL
P. Hendley, Organizer

Section A
Renaissance Washington -- Auditorium

1:15 — Introductory Remarks.

1:20 —257. Probability of exposure to atrazine in northwest Ohio rivers: Long-term trends and seasonal patterns. **R. P. Richards**

1:40 —258. Long-term trend of atrazine residue occurrence in raw water of U.S. Community Water Systems. **W. Chen**

2:00 —259. Update of Watershed Regressions for Pesticides (WARP) for predicting atrazine concentration in streams. **W. W. Stone**, R. J. Gilliom

2:20 —260. Use of estimated stream concentrations in refined endangered species assessments for atrazine. **S. B. Wall**

2:40 — Coffee Break.

2:55 —261. Modeling atrazine concentrations in small Midwestern watersheds using SWAT. **M. F. Winchell**, T. L. Estes, R. Srinivasan, P. Hendley

3:15 —262. Modeling the magnitude and duration of atrazine concentrations in small Midwestern watersheds using PRZM-RIVWQ. **A. M. Ritter**, W. M. Williams, J. M. Cheplick, P. Hendley, N. J. Snyder, M. Ball

3:35 — Concluding Remarks.

Managing Agricultural Gas and Particle Emissions
Cosponsored by GLOBAL
S. L. Trabue, S. R. Yates, and A. S. Gunasekara, Organizers
C. J. Hapeman and L. L. McConnell, Organizers, Presiding

Section B
Renaissance Washington -- Renaissance West A

Structured Discussion of Research Needs and Opportunities

12:45 —263. Agricultural air quality research needs working luncheon discussion. **L. L. McConnell**, **C. J. Hapeman**

Catfish Aquaculture: Producing Safe, Delicious and Nutritious Food
Cosponsored by AGFD and GLOBAL
K. L. Armbrust and J. Johnston, Organizers, Presiding

Section C
Renaissance Washington -- Grand Ballroom South

1:30 — Introductory Remarks.

1:35 —264. Microbiological quality of aquacultured catfish (*Ictalurus punctatus*) and the role of organic acids during processing to improve quality. **G. J. Flick Jr.**, L. S. Douglas, J. L. Silva

1:55 —265. Toward eliminating off-flavors from farm-raised catfish: Bacterial transformations of geosmin and 2-methylisoborneol. **R. W. Eaton**

2:15 —266. Use of molecular markers for catfish production and product quality. **G. C. Waldbieser**

2:35 —267. Catfish imports: Food safety persepectives. **P. Lovera**

2:55 — Coffee Break.

3:10 —268. Depletion of the triazine compounds melamine and cyanuric acid following single oral administration in catfish, *Ictalurus punctatus*, and trout, *Oncorhynchus mykiss*. **E. R. Evans**, W. C. Andersen, C. M. Karbiwnyk, S. B. Turnipseed, G. M. Charles, T. D. Mayer, C. B. Nochetto, N. G. Rummel, R. Reimschuessel

3:30 —269. Catfish serum neutralization and endopep mass spectrometric assays to detect botulinum in catfish. **P. S. Gaunt**, S. R. Kalb, J. R. Barr

3:50 —270. Fluorescence screening of leucomalachite green and leucogentian violet residues in catfish. **G. Chen**

4:10 —271. Monitoring of producer catfish in Mississippi. **K. L. Armbrust**

4:30 — Discussion.

Soil Bound Residues and Relevance to Environmental Exposure
Cosponsored by GLOBAL
S. G. Mislankar and K. Malekani, *Organizers*

Section D
Renaissance Washington -- Grand Ballroom Central

1:00 — Introductory Remarks.

1:05 —272. Perspective on pesticide bound residues: Overview and implications for regulatory interpretation. **D. G. Dyer**, S. G. Mislankar

1:30 —273. Relationship between soil bound residue formation and adsorption processes. **J. Boesten**

1:55 —274. Desorption resistance of chemicals in soil. **J. J. Pignatello**

2:20 —275. Perspective on pesticide bound residues: Effect of assumptions on environmental risk assessments. **R. L. Jones**, D. G. Dyer

2:45 — Coffee Break.

3:00 —276. Contributions of humic material fractions to bound residue formation. **J. A. Rice**, G. Chilom

3:25 —277. Microwave assisted extraction of PCB bound-residues in aquatic sediments. **G. D. Foster**, S. Mansoor, S. U. Khan

3:50 —278. Use of N-15 NMR in studies on the reaction of aromatic amines with soil organic matter to form bound residues. **K. A. Thorn**

4:15 —279. Determining the bioavailability of highly weathered organochlorine insecticide residues. **J. C. White**, J. W. Kelsey

4:40 —280. Accounting for unextracted pesticide residues in environmental fate studies. **R. D. Jones**

Notes and Doodles

AGRO DIVISION

AGRO 1
Characterization of botanical terpene activity in arthropods
Gretchen E. Paluch, gre@iastate.edu, Joel R. Coats, jcoats@iastate.edu, and Lyric Bartholomay, lyricb@iastate.edu. Department of Entomology, Iowa State University, Ames, IA 50011

Botanicals have a long history of use for protection against biting arthropods and reducing the risk of exposure to arthropod-transmitted disease agents. The aim of these studies was to characterize the activity of the plant derived sequiterpenes and further develop these compounds as long-lasting botanical repellents and insecticides. Studies addressed the utility of sesquiterpene-rich essential oils from Amyris, *Amyris balsamifera*, and Siam wood, *Fokienia hodginsii*, and showed spectrum of activity against arthropods including ticks, cockroaches, house flies and mosquitoes. Identification of the most active components of the Amyris and Siam wood essential oils guided the development of quantitative structure-activity relationship (QSAR) models for predicting repellency to the yellow fever mosquito, *Aedes aegypti*.

AGRO 2
Discovery of novel mosquito repellents from structure-activity studies
Maia Tsikolia[1], *Ulrich Bernier*[1], *uli.bernier@ars.usda.gov, Svetoslav Slavov*[2], *C. Dennis Hall*[2], *cdennishall@aol.com, Gary G. Clark*[1], *Kenneth J. Linthicum*[1], *and Alan R. Katritzky*[3], *katritzky@chem.ufl.edu. (1) USDA-Agricultural Research Service, Center for Medical, Agricultural, and Veterinary Entomology, Gainesville, FL 32608, (2) Department of Chemistry, University of Florida, Gainesville FL, (3) Department of Chemistry, University of Florida, Gainesville, FL 32611*

The USDA historical archives of repellents and toxicants consists of over 30,000 chemical structures tested over the past 60 years. We have undertaken a collaborative research project to initially target six subsets of these compounds to discover and develop new chemicals for personal protection and control of mosquitoes. The first subset consisted of 68 candidate mosquito repellents comprised of piperidines and carboxamides. Evaluation of two dose rates using a cloth patch assay with human volunteers indicated that the duration of repellency from one of the carboxamides and 28 of the piperidines was greater than that of DEET when repellents were compared at stoichiometric amounts. Some of the piperidines were repellent on cloth for over 50 days at the 25 µm dose, while DEET provided 7 days repellency using "time to 5 bites" out of 500 mosquitoes as the failure threshold (*i.e.* 1% threshold). Current studies are being extended to evaluate these repellents against other arthropod species, including stable flies (*Stomoxys calcitrans*) and ticks (*Ixodes* and *Ambylomma*).

AGRO 3
Structure-activity relationship studies on intermedeol and callicarpenal: Two arthropod repellents identified from the Southern folk remedy, *Callicarpa americana*
Charles L. Cantrell[1], *clcantr1@olemiss.edu, Jerome A. Klun*[2], *klunj@ba.ars.usda.gov, James Becnel*[3], *james.becnel@ars.usda.gov, and Julia Pridgeon*[3], *julia.pridgeon@ars.usda.gov. (1) NPURU, USDA-Agricultural Research Service, Thad Cochran Research Center, University, MS 38677, (2) Chemicals Affecting Insect Behavior Laboratory, USDA-Agricultural Research Service, Beltsville, MD 20705, (3) Center for Medical, Agricultural, and Veterinary Entomology, USDA-Agricultural Research Service, Gainesville FL 32608*

In previous studies on the American beautyberry (*Callicarpa americana*), it was demonstrated that callicarpenal and intermedeol are responsible for the arthropod repelling ability of this folk remedy. Both compounds showed significant bite-deterring activity against Aedes aegypti and Anopheles stephensi. Callicarpenal and intermedeol were also evaluated in laboratory bioassays for repellent activity against host-seeking nymphs of the blacklegged tick, *Ixodes scapularis*, a known vector for Lyme disease, and also against *Amblyomma americanum*, a known vector for erlicheosis. In the present study, structural modifications were performed on both callicarpenal and intermedeol in an effort to understand in part the functional groups necessary for maintaining and/or increasing the activity. Among the modifications to callicarpenal that will be discussed are the oxidation and reduction of the C-12 aldehyde to its corresponding acid or alcohol, complete reduction of the C-3 olefin, epoxidation of the C-3 olefin, and various methyl ester and acetate products. Combinations of the above modifications will also be discussed as well as their effects on both biting-deterrency and toxicity against Ae. aegypti. Additionally, the effects of epoxidations, allylic oxidations, and catalytic hydrogenation to intermedeol will be discussed.

AGRO 4
Efficacy of the plant-based repellent, BioUD® against mosquitoes and ticks
Brooke W. Bissinger[1], *Brookellen@yahoo.com, Jiwei Zhu*[1], *jzhu4@ncsu.edu, Charles S. Apperson*[1], *charles_apperson@ncsu.edu, D. Wesley Watson*[2], *wes_watson@ncsu.edu, Daniel E. Sonenshine*[3], *dsonensh@odu.edu, and R. Michael Roe*[1], *michael_roe@ncsu.edu. (1) Department of Entomology, North Carolina State University, Raleigh, NC 27695, (2) Department of Entomology, North Carolina State University, Raleigh, NC 27695, (3) Department of Biological Sciences, Old Dominion University, Norfolk, VA 23529*

The wild tomato plant, *Lycopersicon hirsutum f. glabratum* is covered in glandular trichomes containing chemicals that confer resistance to numerous herbivorous pests that feed on cultivated tomatoes. Two of these chemicals, 2-undecanone and 2-tridecanone, are also repellent to blood-feeding arthropods. BioUD® is a commercially available arthropod repellent that contains 7.75% 2-undecanone and was approved for use by the US EPA in 2007. Efficacy of BioUD® was compared to that of other commercially available repellents against mosquitoes and ticks. In arm-in-cage bioassays, BioUD® was as repellent as 7% and 15% DEET against the mosquitoes *Aedes aegypti* and *Ae. albopictus*, respectively. In mosquito field trials, BioUD® was as repellent as 25% DEET in North Carolina and more repellent than 30% DEET in Ontario 6 h after application. BioUD® was more repellent than 98.1% DEET against the

ticks *Amblyomma americanum* and *Ixodes scapularis* and provided equivalent repellency against *Dermacentor variabilis* in choice tests on filter paper. On cotton cheesecloth, BioUD® was more repellent than 15% Picaridin and 0.5% permethrin and provided equivalent repellency to 98.1% DEET, 30% oil of lemon eucalyptus, and 19.6% IR3535® against *A. americanum* and *D. variabilis*.

AGRO 5
Essential oil insect repellents: A formulator's challenge
***Rod Bradbury**, rbradbury@ecosafenatural.com, EcoSafe Natural Products, Inc, Saanichton, BC, Canada*

Abstract text not available

AGRO 6
Current and future herbicides available for organic farmers
***Stephen O. Duke**, sduke@olemiss.edu and Franck E. Dayan, franck.dayan@ars.usda.gov, USDA-Agricultural Research Service, Natural Products Utilization Research Unit, University, MS 38677*

Herbicides offer both economic and environmental advantages over cultural methods of weed control such as tillage, hand weeding, and plastic mulches. Compared to conventional agriculture, organic agriculture has few and inferior options available for weed management. Most of the chemical products for organic weed management are plant-derived essential oils or mixtures of essential oils that provide non-selective weed control. The amount of material needed for effective weed management is generally orders of magnitude higher than used with synthetic, selective herbicides. Organically produced acetic acid is also used as a burn down-type herbicide. Pelargonic acid-based products also provide this type of activity. Maize gluten is sold as a soil amendment, but is also used by organic farmers for weed management. Its herbicidal activity is due to di- and pentapeptides with unknown modes of action. Bialaphos, a fermentation product that is bioconverted to the herbicidally active glufosinate enantiomer, has potential in organic weed management. Other fermentation products, such as tentoxin, have desirable weed/crop selectivity, but are too expensive at this time. Highly active, and to some extent, selective components of essential oils will also be discussed as potential future products for organic weed management.

AGRO 7
Management and regulation of natural products in biologically based weed control systems
*John R. Teasdale, john.teasdale@ars.usda.gov, **John Lydon**, john.lydon@ars.usda.gov, , and Clifford P. Rice, cliff.rice@ars.usda.gov, Sustainable Agricultural Systems Laboratory, USDA-Agricultural Research Service, Beltsville, MD 20705*

Weed control has been identified as an important challenge to organic farming because of the inability to use synthetic herbicides. Organic farmers must employ integrated systems that include several modes of action for killing weeds including physical disturbance, smothering, competition, and phytotoxic natural products. Natural products can be delivered through several methods, either release from decomposing cover crops, production by microorganisms, or as isolated “natural herbicides”. Benzoxazinoids, byproducts of rye cover crops, have been shown to inhibit several weed species but their efficacy may be limited because of rapid soil degradation. Isothiocyanates, phytotoxic byproducts of brassica degradation, also persist for relatively short periods in soil. Genes for phytotoxic metabolites of microorganisms can be manipulated to improve efficacy of microbial biological control agents or for potential production of natural herbicides. Global regulatory systems controlling gene expression can be altered to increase phytotoxin production and pathogenicity of these microorganisms.

AGRO 8
Opportunities for the use of plant essential oil-based insecticides in organic agriculture
***Murray B. Isman**, murray.isman@ubc.ca, Faculty of Land and Food Systems, University of British Columbia, Vancouver, BC V6T 1Z4, Canada*

Certified organic producers have traditionally had a limited arsenal of pest management products available for use, but certain plant essential oils (mints, thyme, rosemary, clove, citrus) have a broad spectrum of activity that can be exploited for integrated pest management in organic food production. Some products based on essential oils have demonstrated efficacy against insect and mite pests, likely through a combination of lethal neurotoxicity and sublethal repellence/deterrence. Some oils (rosemary, thyme) have useful prophylactic activity against plant pathogenic fungi such as powdery mildew, while others (clove, citrus) are sufficiently phytotoxic at appropriate concentrations that they can be used as herbicides – with few competing products. Essential oil-based pesticides might also prove valuable in animal production, e.g. for fly control in organic diary operations. Results from recent field trials and recent commercial successes using essential oil pesticides will be presented, along with a discussion of both the opportunities and the limitations for their use.

AGRO 9
Natural products as sources for biopesticides
***Marja E. Koivunen**, mkoivunen@marroneorganics.com, and Pam G. Marrone, pmarrone@marroneorganics.com, Marrone Organic Innovations, Inc, Davis, CA 95618*

Natural products from plant and microbial sources can be successfully used for the development of new biopesticides. With previously unknown chemistries and novel modes of action, these products offer improved efficacy and tools for resistance management, which makes them attractive for both organic and conventional farming systems. Recently, Marrone Organic Innovations (MOI) has introduced two plant-based biopesticides, GreenMatch EX and Regalia™ SC, to the market, and is currently screening bacteria, actinomycetes, and fungi that produce secondary metabolites with activity against weeds, insects, nematodes and plant pathogens. Our in-house screening program uses a wide variety of whole-organism and high-throughput enzyme assays. One of MOI's current development projects is focusing on an urgent need of a selective, organic herbicide for rice. The development of this microbial bioherbicide containing thaxtomin A as an active compound, as well as our promising results with a new broad-spectrum microbial insecticide are highlighted in this presentation.

AGRO 10
Current status and future opportunity for semiochemicals in organic farming
***Philipp Kirsch**, semiochem@aol.com, West Linn, OR 97068*

Semiochemicals are widely used for detection and control of insect pests in agriculture. Sex pheromone-based traps provide information that informs integrated pest management programs. Mating disruption technology is the foundation of tortricid moth control programs in pome and stone fruit production, and vineyards. In some countries, organic certification is available for programs using semiochemical baited targets, that combine attractants with low rates of insecticides, in management of tephritid fruit flies. Future opportunity exists to develop and expand implementation of semiochemical-based management tools that exploit insect host-seeking, oviposition or feeding behaviors. Optimized blends of floral fragrances have been

proven effective in suppression of several moth species when combined with a toxicant. This presentation will summarize the status of current semiochemical management programs, and explore future horizons for further prospecting, development and deployment of semiochemicals to enhance pest control outcomes in organic farming.

AGRO 11
Semiochemicals: Application in organic farming
Kamlesh R. Chauhan, *kamal.chauhan@ars.usda.gov, USDA-Agricultural Research Service, Invasive Insect Biocontrol and Behavior Laboratory, Beltsville, MD 20705*

Semiochemicals are one of the most important classes of biopesticide compounds indigenous to plant and insects. In our laboratory we have evaluated different classes of chiral chemicals utilized in insect chemical signals and their efficacy were evaluated in the field studies either to attract beneficial insects for biocontrol or for mating disruption of economic insect pest. Our approach towards formulating better and long lasting insect semiochemicals uses structure activity relationships, and is based on identified ligands selection of natural products. We developed strategies to utilize semiochemicals in integrated pest management and organic farming.

AGRO 12
Natural product based biopesticides and the organic market.
Michael P. Braverman, *braverman@aesop.rutgers.edu, J. J. Baro[1], jbaron@aesop.rutgers.edu, Daniel L. Kunke[2], kunkel@aesop.rutgers.edu, and Van Starner, starner@aesop.rutgers.edu. IR-4 Project, Rutgers University, Princeton, NJ 08540*

Organic production constitutes 3-5% of U.S. food production with a total of 200,000 acres of organic fruits and vegetables. In addition to limited acreage, organic growers rely on cultural practices for pest management rather than applying organically approved pesticides. Average organic farm size has increased and conventional farmers produce organic crops on larger scale than traditional organic producers. Larger farms do not rely on cultural pest management alone because the scale precludes practices that depend heavily on labor. Quality expectations of most organic produce are equal to conventional produce so organic pest management level requirements have changed from pest suppression to pest control. Some major crop protection companies have begun to take interest in the organic pest control market, especially for homeowners. As the percentage of farms involved in large scale organic farming increase the needs for pest management based on applying an organically approved pesticide are likely to increase and are likely to include pest management tools based upon biopesticides. The primary target of biopesticide products is still conventional farming.

AGRO 13
Phosphorus composition of wet and dried poultry litter-amended soil by enzyme hydrolysis and solution ^{31}P-NMR
Nicholas R. Johnson, *nrjohnso@uvm.edu and Jane E. Hill, Department of Civil and Environmental Engineering, University of Vermont, Burlington, VT 05405*

Knowledge of how soil P speciation and bioavailability shifts between wet and dry manure-amended soil will help optimize the predictive power of agricultural management tools including Phosphorus Indices. We have modified and then used in a time series, an enzymatic soil P assessment method first developed by Dr. Zhongqi He for manures. Specifically, we have tracked P species over time in manure-amended soil using a cocktail of phosphohydrolases. We compared enzyme measures with solution 31P-NMR as well as contrasted wet and dry sample preparations. We report that enzymatic tracking of manure-amended soil extracts is robust. We report that sample preparation directly impacts the concentration and speciation of P compounds; namely, P speciation shifts from organic to inorganic resulting in an increase of bioavailable P by 20%. A complimentary decrease in simple monoester P and phytate-like P was observed.

AGRO 14
Raman spectra of organic (myo-inositol hexakis phosphate) and inorganic spectra show pH dependence
Lynne Heighton, *heighton@umd.edu, Department of Chemistry and Biochemistry, University of Maryland, College Park, MD 20742-4454, and Walter F. Schmidt, walter.schmidt@ars.usda.gov, USDA-Agricultural Research Service, Beltsville, MD 20705*

Understanding phosphorous fate and transport is in part limited by technical difficulties and/or access to expensive equipment associated with differentiating ortho-phosphate (P) from organic phosphate in complex environmental samples. Myo-inositol hexakis phosphate (IHP) is the most prevalent form of organic P in soil and manure. Recent research has shown phytate (anionic salt of IHP) to form pH dependent complexes with cationic mineral components (iron and copper) of soil. Vibrational spectroscopy provides an analytical tool capable of measuring small changes in speciation at the molecular level. Raman spectroscopy was used to monitor pH dependent frequency shifts in P and IHP. Solutions of OP (600 mM) and IHP (100 mM), normalized for phosphate concentration were pH adjusted with 0.5 pH unit increments over a pH range of 3-10.5. Solutions were made in triplicate. Raman spectra were collected from 100-2500 cm-1 using a Horbia Jobin Yvon Raman spectrophotometer with a CCD and a 633 nm helium-neon laser. Significant spectral frequency shifts and changes in spectral intensity were observed as a function of pH for both IHP and P solutions allowing for the differentiation of IHP and P at several pH points. The ability to simultaneously study IHP and P within a single sample may decouple environmentally relevant pathways for fate and transport of phosphorous facilitating the real time analysis of its mineralization processes.

AGRO 15
Phytate degradation and transport in poultry manure-amended soil under simulated leaching
Courtney Giles, *cdgiles@uvm.edu and Jane Hill, School of Engineering, University of Vermont, Burlington, VT 05401*

Understanding phytate transport and degradation in manure-amended soils may improve agricultural management practices. In this study, three poultry manure-applied soil columns, wet-packed with Vermont sandy-loam, were sampled for eleven weeks as leachate (weekly) and soil

(0-5, 5-10, 10-15cm depth; biweekly). Water and bicarbonate soil extracts were measured for molybdate-reactive P (MRP). Total soil digests were analyzed for P and metals (Ca, Mg, Mn, Fe, Al) using ICP-OES. Soil phosphatase activities were measured. Phosphorus speciation in one of three columns was determined using solution 31P-NMR spectroscopy of NaOH-EDTA-extracted soils. Leachate MRP, total P and metals were measured. Study results suggest that in similar systems: (1)Phytate-P will migrate down the soil column in the first six weeks, (2)degradation products of phytate and Scyllo-P will accumulate at the 10-15cm depth, (3)maximum labile-P will occur and exit the system in the fourth week as a function of microbial activity and soil solution pH.

AGRO 16
Chemistry and dynamics of organic phosphorus in the environment
***Benjamin L Turner**, TurnerBL@si.edu, Smithsonian Tropical Research Institute, Balboa, Ancon, Panama*

Organic phosphorus is ubiquitous in the environment, yet its role in the eutrophication of waterbodies remains poorly understood. This is due in part to difficulties in the determination of organic phosphorus compounds in environmental samples, although solution phosphorus-31 nuclear magnetic resonance spectroscopy has proved a versatile technique for application to the complex matrices of soil and sediment extracts. Organic phosphorus forms a large proportion of the total phosphorus in soils, manures, runoff, and aquatic sediments. Much of this occurs as phytate (salts of *myo*-inositol hexakisphosphate), while soils also contain stereoisomeric forms of inositol phosphates (e.g., *scyllo*-inositol hexakisphosphate) that are extremely rare elsewhere in nature. Organic phosphorus is mobile in soils and readily transferred in runoff to water bodies, where it can be utilized by cyanobacteria and other aquatic organisms associated with eutrophication. Organic phosphorus therefore warrants further attention as part of efforts to reduce the impact of pollutant phosphorus transfer on waterbodies.

AGRO 17
Antimicrobial activity of metal-containing nanoparticles is not restricted to pathogenic bacteria
***Anne Anderson**, anderson@biology.usu.edu, Department of Biology, Utah State University, Logan, UT 84322*

Nanoparticles with antimicrobial activity are being used in many formulations from paints to textiles as well as in direct applications to targets. Our research examined the interaction of these nanoparticles in commercial preparations with an environmental microbe, *Pseudomonas putida* KT2440. This microbe inhabits soil, has bioremediant properties and is an effective root colonizer. Thus, antimicrobial effects of nanoparticles would be harmful to this type of microbe. *P. putida* KT2440 was engineered to become a biosensor for cell toxicity by the expression of plasmid-borne genes endowing light production. We demonstrate rapid dose-dependent toxicity, as observed by loss in light output for this biosensor, with commercially produced nanoparticles of Ag, CuO and ZnO. Loss in light output correlated with loss in culturability for nano-Ag, reduced culturability for nano-CuO and bacteriostasis for nano-ZnO at up to a 10 mg/L dose. Fractionation of suspensions of nano-CuO and nano-ZnO by field flow fractionation showed agglomeration of particles to a mean size of 390 nm but also the presence of nanoparticles about 5 nm in size. Filtration of the suspensions determined that the materials passing through a 220 nm filter were still active on the biosensor. Our current studies are determining whether this activity resides with metal ions released from the nanoparticles or with nano-sized complexes.

AGRO 18
Electrochemical biosensors based on advanced nanomaterials for toxicity risk assessment
***Silvana Andreescu**, eandrees@clarkson.edu, Department of Chemistry and Biomolecular Science, Clarkson University, 8 Clarkson Ave, P.O. Box 5810, Potsdam, NY 13699*

Rapid progress of the nanotechnology and advanced nanomaterials production offers significant opportunities for designing powerful biosensing devices that can be used for detection of a broad range of food and environmental contaminants. The convergence of electroanalytical techniques and nanotechnology provides attractive possibilities for development of miniaturized, rapid, ultrasensitive and inexpensive sensors for in situ and field-based toxicity monitoring devices. This presentation will discuss new ways of designing biosensors with improved selectivity and lower detection limits. The construction of several electrochemical biosensors for the sensitive detection of environmental and agricultural food contaminants using various nanostructures and nanoparticles will be discussed.

AGRO 19
Genetic risk assessment: Current strategies to evaluate transgenic risks
***Allen Good**, allen.good@ualberta.ca, Department of Biological Sciences, University of Alberta, Edmonton, AB T6H 2X6, Canada*

No clear consensus has emerged in the debate about the risks posed by transgenic crops and how to accurately assess these risks. However, the expanding interest in using transgenic crops to produce pharmaceutical and industrial products has developed interest in rational ways to assess the real risks associated with transgenes. For example, potential strategies to impede transgene movement have been published in the scientific literature and numerous patents have been submitted; however, the efficacy or value of such strategies remains to be determined and must also be evaluated in a field situation. This presentation will discuss basic concepts of risk assessment and the role of genetic strategies to restrict the spread of transgenes. Additionally, I will discuss the need for a more rational and scientific approach to risk assessment.

AGRO 20
Understanding and coping with social risk in biotechnology risk assessment
***Paul Thompson**, thomp649@msu.edu, Agricultural, Food and Community Ethics, Michigan State University, East Lansing, MI 48824*

We should resist “single bullet” theories of why GMOs have aroused political and social opposition. One contributing cause is that inequalities in access to or ability to utilize information create objectively real vulnerabilities that may be impossible to overcome, at least over a short run. Because biological scientists are relatively rich in information access with respect to genetic technology, they have been slow to acknowledge the validity of risks grounded in information inequality, and have too often engaged in conduct that amplifies these risks. Future programs to pursue genetic technology should be coupled with a serious commitment to better illuminate these vulnerabilities and to develop methods of deliberation, engagement and communication that can mitigate risks arising from information inequality.

AGRO 21
Nanotechnologies for microbicidal applications: Identification of risks and opportunities
Nathan S Swami, *nswami@virginia.edu, Department of Electrical Engineering, University of Virginia, Charlottesville, VA 22904*

The development of nanotechnologies based on silver nanoparticles (Ag-nps) and titania nanoparticles (TiO_2-nps) for microbicidal applications is of great interest. The microbicidal action of Ag-nps is due to extended release of Ag^+, which is known to affect bacterial metabolism; and due to the mediation of reactive oxygen species (ROS) that disrupt bacterial cell membranes. Similarly, the photocatalytic action of TiO_2-nps results in the release of hydroxyl ROS that disrupt bacterial cell membranes. Additionally, nanotechnologies enable features for the triggering of controlled release, enabling some degree of selectivity (through appropriate nanoparticle functionalization) and enhancing functionality (sensing, collection and microbicidal action) of the materials. Recent product surveys estimate that close to a third of the total available nanotechnology products (nano-products) are composed of formulations containing Ag-nps or TiO_2-nps for microbicidal applications. In many of these cases, the potentially adverse environmental implications arising from the attrition of free Ag-nps or TiO_2-nps are not accounted. These include microbicidal effects of the desorbed free nps on non-pathogenic bacteria, especially those regulating useful environmental functions such as nitrification processes within the soil; the increased resistance of microbes to silver due to greater bio-availability of Ag-nps; and effects of nanoparticle run-off into fresh water. We present here a framework to aid in the identification of substantive risks, to enable risk-based, rather than list-based regulation of nanotechnology, by accounting for the entire life-cycle of the nanotechnology product.

AGRO 22
Risk assessment for nanomaterials: Challenges and management approaches
Igor Linkov, *Igor.Linkov@usace.army.mil, US Army Engineer Research and Development Center, Brookline, MA 02446, and Jeffery Steevens, Jeffery.A.Steevens@usace.army.mil, US Army Engineer Research and Development Center, Vicksburg, MS 39180*

There is rapidly growing interest by regulatory agencies and stakeholders in the potential risks associated with nanomaterials throughout the different stages of products' life cycle (e.g., development, production, use and disposal). Risk assessment methods and tools developed and applied to chemical and biological agents may not be readily adaptable for nanomaterials because of the current uncertainty in identifying the relevant physico-chemical and biological properties that adequately describe the materials. Such uncertainty is further driven by the substantial variations in the properties of the original material because of the variable manufacturing processes employed in nanomaterial production. We propose a decision support system for classifying nanomaterials into different risk categories. The classification system is based on a set of performance metrics that measure both the toxicity and physico-chemical characteristics of the original materials, as well as the expected environmental impacts through the product life cycle.

AGRO 23
Mixtures of 17α-ethinylestradiol (EE2) and aqueous C60 aggregates decrease bioavailability of EE2 and change C60 aggregate characteristics
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We investigated the effects of 17α-ethinylestradiol (EE2) on characteristics (size and charge) of aqueous C60 aggregates (nC60) and the effect of nC60 on bioavailability of EE2 in larval zebrafish. Prepared solutions were tested at time (T)=0 and were held in ambient daylight (not direct sunlight) for test at T=4 weeks. Solutions included solvent control, positive control (1 µg EE2/L), nC60 only (20%, 50%, 80%), and nC60 (20%, 50%, 80%) + EE2 (1 µg EE2/L). Bioavailability of EE2 was evaluated by expression of zebrafish vitellogenin 1 (vtg1) by qRT-PCR. Expression of vtg1 decreased with increases in concentration of nC60 in EE2+nC60 treatments at T=0 and T=4 weeks indicating a strong association between EE2 and nC60. Size and charge of nC60 were influenced by the presence of EE2, and interaction of EE2 affected on sedimentation/settling of nC60+EE2 and consequent reduction in EE2-bioavailability.

AGRO 24
Plant essential oils as repellents and/or deterrents to agricultural pests
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The concept of using non-lethal behavior-modifying substances for management of arthropod pests of agricultural crops has been long touted but as yet largely unexploited on a commercial scale. Numerous natural products have demonstrated repellent, antifeedant or oviposition deterrent activities in laboratory bioassays using pest insects, but consistent efficacy under field conditions has seldom been achieved. In part this results from the ability of insects to habituate to deterrent compounds on repeated or continuous exposure. Plant essential oils represent a relatively new class of natural insecticides efficacious against a wide range of pests. While their neurotoxicity to insects and mites is widely recognized, there is strong anecdotal evidence that in some contexts efficacy could be attributed to their actions as behavior modifiers (i.e. as repellents or deterrents). Results of behavioral bioassays that explore the potential of certain essential oils and their constituents as repellents and deterrents to the twospotted spider mite and some other agricultural pests will be presented.

AGRO 25
Mechanisms of vertebrate herbivore repellency
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Repellents (devices applied to a food source for the purpose of reducing intake) can be categorized into four categories: 1) Stimuli that exploit the herbivore's fear of unfamiliar visual, olfactory, or taste cues; 2) Chemicals that act on the herbivore's trigeminal system; 3) Toxicants that produce

negative postingestive consequences and are avoided as a result of conditioning or learning; and 4) Sensory signals that represent perceived consequences, such as those impacting the species on an evolutionary scale. Because the effectiveness of repellents can depend on both the mechanism and the motivation of the individual herbivore, recognition of these mechanisms is needed for proper evaluation and testing of candidate repellents. For example, when alternative foods are available, shiny ribbons (repellent with no consequence) may provide significant protection in localized areas. However, when alternative foods are scarce, repellents that impart actual consequences to the herbivore will be required to effectively reduce browsing.

AGRO 26
Research on tick repellents: Playing catch up
***John F. Carroll**, john.carroll@ars.usda.gov, Animal Parasitic Diseases Laboratory, USDA-Agricultural Research Service, Beltsville Agricultural Research Center, Bldg. 1040, BARC-East, Beltsville, MD 20705*

Historically ticks have received little attention compared to mosquitoes, in the research and development of repellents. With the rise of tick-borne disease during the past two decades, greater attention has focused on repellents as a last line of protection against tick bites. Deet has dominated the repellent market since the 1950s in products for use on human skin while permethrin has become a standard for clothing treatments. However, new products and compounds from natural sources, some of which are discussed in this presentation, are also proving to be effective tick repellents. Two medically important tick species, *Ixodes scapularis* and *Amblyomma americanum*, have been shown to detect the repellents deet and SS220 by olfaction, but little is known about the mode of action. *Ixodes scapularis* and *A. americanum* differ in their responses to repellents in terms of behavior and efficacy, with implications for repellent testing and development.

AGRO 27
Mosquito repellents for the tropics: From the lab to the field
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Abstract text not available

AGRO 28
Research and development of all natural, plant-derived insecticides, pesticides, and repellents for the control of disease-vectoring arthropods of public health importance
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Vector-borne infectious diseases such as tick-transmitted Lyme disease and mosquito-borne West Nile virus and other arboviruses continue to pose a significant public health threat resulting in human and economic loss in the United State and around the globe. Protection against arthropod attack is best achieved by avoiding arthropod infested habitat, application of repellents, and/or the use of synthetic chemical pesticides. While effective, many citizens are hesitant to use them due to concerns about short range toxicity and long range health problems attributed to these chemicals. Laboratory and field trials conducted against ticks, fleas, and mosquitoes using several naturally derived compounds and extracts from forest resources and agricultural residues have been shown to be excellent biocides and repellents. Compound structures and bioactivities will be discussed.

AGRO 29
Impact of technical, ethical and regulatory developments on registration of repellents
***Clara Fuentes**, fuentes.clara@epa.gov, Biopesticides and Pollution Prevention Division, Environmental protection Agency, Arlington, VA 22202*

Technical challenges and ethical requirements impact efficacy evaluation of repellents as required for supporting efficacy claims against public health pests on product labels. Updates in regulatory policies for controlling disease vectors will be addressed as they may affect evaluation and consequently, registration of repellent products. Research needs will be identified, including a summary of proposed strategies for improving communication to consumers.

AGRO 30
Evaluation of insects repellents from research to consumer protection
***Daniel Strickman**, Veterinary and Medical Entomology, USDA-Agricultural Research Service, GWCC-BLTSVL, 5601 Sunnyside Avenue, Beltsville, MD 20705-5148*

Standardized testing and evaluation of insect repellents is a current subject of intense study by US EPA and USDA. The challenges arise from several aspects of these products. First, the mode of action of active ingredients varies, even though we know little about the exact mechanisms. Second, the inherent repellency of an active ingredient is very different from its duration of repellency in a formulated product. Finally, ethical considerations dictate minimization of risk and discomfort during tests, tending to base results on the most exceptional members of an insect population. Some potential solutions are suggested for methods, analysis, and interpretation.

AGRO 31
Pymetrozine inhibits feeding in Asian citrus psyllid, *Diaphorina citri*: Potential for preventing greening disease bacterium transmission
***Dhana Raj Boina**, drboina@ufl.edu, Youngnam Youn, and Lukasz Stelinski, stelinski@ufl.edu, Entomology and Nematology Department, University of Florida, Citrus Research and Education Center, Lake Alfred, FL 33850*

The Asian citrus psyllid (ACP), *Diaphorina citri*, is the most important pest of citrus worldwide. It causes both direct and indirect damage by feeding on plant sap and by acting as a vector of three bacterial species in the genus *Candidatus* Liberibacter. The *Candidatus Liberibacter spp.* are thought to be the causal agents for a deadly citrus disease, huanglongbing (HLB) or citrus greening. Pymetrozine, a pyridine azomethine compound, is known to selectively inhibit the feeding of sucking insect pests by affecting the nerves involved in controlling the salivary pump. Irreversible inhibition of feeding by pymetrozine causes insect death due to starvation. In a series of laboratory experiments, pymetrozine was shown to modify the feeding behavior of adult ACP. In choice feeding site experiments, pemetrozine repelled adult ACP. ACP adults released on plants treated with pymetrozine showed decreased survival compared to adults feeding on the control plants. Pymetrozine also inhibited feeding in adult ACP when adults were allowed to feed on leaf discs either sprayed or treated systemically with pymetrozine as measured by reduced honeydew excretion compared with control leaf discs. Electrical penetration graph recordings of ACP adults feeding on plants treated with pymetrozine further confirmed the above results of feeding inhibition. The implications of feeding inhibition by pymetrozine on HLB bacterial transmission by ACP adults are discussed.

AGRO 32
Unsuitability of fluorescein for use as a soil tracer dye
***Chris J. Peterson**, cjpeterson@fs.fed.us, Insects, Diseases and Invasive Plants Research Unit, USDA Forest Service, 201 Lincoln Green, Starkville, MS 39759*

Fluorescent tracer dyes have been used for over 130 years to track the movement of water. More recent applications include determination of spray distribution and the modeling of solute transport through a substrate. In this study, it is demonstrated that fluorescein, a weak acid, is unsuitable for determining solute distribution and transport through soil, especially acidic soils. Fluorescein was recovered by soaking extraction from only one of the five soils tested. Recovery of applied bromide in these soils was high. The mobility of fluorescein and bromide were studied in packed soil columns at rates simulating perimeter and sub-slab pretreatment for prevention of termite infestation. Fluorescein was only detected in the eluates of sand and of alkaline soil; the elution patterns of the two soils differed. A high percentage of applied bromide was recovered from cone plot eluates, although the elution patterns of bromide differed slightly in different soils.

AGRO 33
Characterization of acetylcholinesterase inhibition by botanically-derived terpenoids in arthropods
***Jennifer Anderson**, jaanders@iastate.edu, Gretchen E. Paluch, gre@iastate.edu, and Joel R. Coats, jcoats@iastate.edu. Department of Entomolgy, Iowa State University, Ames, IA 50011*

Many botanically-derived terpenoids exhibit strong repellency against several insect pests. The mode of action of terpenoid repellency and toxicity remains uncharacterized. An *in vitro* colorimetric assay, based on the methods of Ellman et al. (1961), was developed to characterize the degree of acetylcholinesterase (AChE) inhibition by two terpenoids (A and B), using housefly (*Musca domestica*), mosquito (*Aedes aegypti*), tick (*Dermacentor variabilis*) and cockroach (*Periplaneta americana*) as arthropod models. The assay was optimized for each arthropod model and was validated using carbaryl as the positive control. The inhibitory concentration (IC_{50}) for carbaryl was 1-2 µM in all models. The IC_{50} for terpenoid A and B were >1.3 mM and >30 mM, respectively. Results demonstrate slight AChE inhibition caused by terpenoids at concentrations over 1000 fold higher than that of the positive control. These results indicate that AChE inhibition is not a major mode of action for terpenoid toxicity and repellency.

AGRO 34
Effect of flavonoid antioxidants on the formation of acrylamide toxin in potato products
***Yu Zhang**, yzhangresearch@yahoo.com.cn, Massachusetts General Hospital and Harvard Medical School, Brookline, MA 02445, and Ying Zhang, y_zhang@zju.edu.cn, Department of Food Science and Nutrition, Zhejiang University, 268 Kaixuan Road, 516 Food Building, Hangzhou 310029, China*

Acrylamide, a reproductive and carcinogenic toxin, is widely found in carbohydrate-rich foods. The effect of 24 different flavonoids on the formation of acrylamide including their structure-activity relationship is described. Flavonoids were incubated at different concentrations, and acrylamide formation was determined in a potato-based asparagine-glucose model system with microwave heating. A structure-activity analysis on the ability of flavonoids to inhibit acrylamide formation using QSAR method demonstrated that both number and position of aromatic hydroxyl functional groups play an important role in the ability of flavonoids to inhibit the formation of acrylamide *in vitro*. Further, flavones were more effective than isoflavones, which carried an identical number of aromatic hydroxyls. Flavone *C*-glycosides are more effective at inhibiting the formation of acrylamide than flavone *O*-glycosides despite sharing the same structure aglycone. These observations are important for our understanding and future development of agents which might decrease the formation of such important toxins.

AGRO 35
Effects of organic amendments on herbicide behaviors in soil
***Laura I. Delgado-Moreno**, lmoreno@ucr.edu, Department of Environmental Sciences, University of California-Riverside, Riverside, CA 92521*

Use of organic agroindustrial waste as soil amendments to modify pesticide dynamics in soils could be a worthwhile solution to both problems related to pesticide residues in soil and the need for organic waste disposal. The effect of olive cake and its biotransformed products, i.e., compost and vermicompost, on sorption/desorption and on the degradation of sulfonylureas and triazines in soil was studied. Results showed that more polar herbicides were less influenced by amendment addition to soil. Moreover, organic amendments induced selective release of herbicides, and this effect varied with the maturity of the organic amendments achieved by their biological transformation. Water soluble substances derived from olive cake enhanced sorption for more hydrophobic triazines, while humin and mineral fractions played a major role in sulfonylureas sorption. In addition, enhanced pesticide degradation was observed with the addition of the most transformed amendments to soil. Behaviors of herbicide mixtures in the amended soils appeared to be complicated by competition phenomena.

AGRO 36
Simultaneous determination and confirmation of melamine and cyanuric acid in fish kidneys by LC/MS/MS
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Recent animal feed contamination with melamine and related compounds such as cyanuric acid has raised concerns for public health due to potential residues in various animal products. Since melamine combines with cyanuric acid to form relatively insoluble crystalline complexes which collect in kidney tubules, we initiated studies to develop a method to simultaneously determine toxicological levels of concern (range of 0.4 to 50 ppm (µg/g)) of melamine and cyanuric acid residues in fish kidneys. Channel catfish *Ictalurus punctatus* and rainbow trout *Oncorhynchus mykiss* were exposed to a single oral dose of 20 mg/kg body weight of melamine plus 20 mg/kg cyanuric acid. Kidney samples were homogenized in 2.5% aqueous formic acid, sonicated, mixed, centrifuged and filtered. Samples were diluted in acetonitrile and analyzed by tandem mass spectrometry coupled with Zwitterionic hydrophilic interaction chromatography. Percent recoveries, matrix effects and coefficients of variation were evaluated at two levels, 1.6 and 25 ppm.

AGRO 37
Chlorophacinone metabolism and inhibition in Wistar Norway rats and meadow voles using liver microsome experiments
***Thomas M. Primus**, Thomas.M.Primus@aphis.usda.gov, Katherine E. Horak, and Chad R. Wermager, Analytical Chemistry Project, USDA/APHIS/WS/National Wildlife Research Center, Fort Collins, CO 80521*

Chlorophacinone is an anticoagulant used in formulated products to control populations of pest rodent species such as rats, ground squirrels, pocket gophers and voles. Chlorophacinone has been used for meadow vole control in central California artichoke fields for over two decades. Some populations of meadow voles, *Microtus californicus*, now display resistance to rodenticides. These populations reside in agricultural areas and cause tremendous economic damage. Similar to the use in the pharmaceutical industry, the use of liver microsomes from animals of interest facilitates the study of metabolic profiles and the possible determination of differences related to resistance. The use of microsomes in screening rodents for anticoagulant resistance is a novel application of these techniques. It is useful by enabling the study of a larger sampling of animals with a more diverse amount of compounds than would be possible with live animal studies. The metabolites produced as part of the phase I metabolism of chlorophacinone were observed and their ratio to the parent peak measured. Liver microsomes purified from Wistar rat livers and meadow voles incubated at 37 °C produced similar metabolites but in different proportions. The metabolites were easily analyzed by HPLC with UV detection with the identification of the metabolites confirmed by HPLC/mass spectrometry (HPLC/MS).

AGRO 38
Determination of 20,25-diazacholesterol residues in tissues of exposed birds
***D. A. Goldade**, David.A.Goldade@usda.gov, Laura E. Hulslander, and Christi A. Yoder, National Wildlife Research Center, USDA/APHIS/WS, Ft. Collins, CO 80521*

Increasing populations of pest bird species cause significant damage to agricultural crops and pose risks to commercial aircraft from bird strikes. Lethal control, while effective, is often politically charged. Another approach being investigated is the use of a chemo-sterilant to reduce populations. The chemical agent 20,25-diazacholesterol is one promising candidate. This agent blocks steroid synthesis and prevents birds from forming viable eggs. The method described was developed to analyze for 20,25-diazacholesterol residues in tissues of exposed birds. The method employs a polymeric cation exchange column to remove matrix components. A significant improvement in method performance was achieved through the use of LC/MS/MS as the detection technique.

AGRO 39
Green residue laboratory: Development of microtechnology and automation for the analysis of pesticides in plants, soil, water, and post consumer resin samples
***Samy Abdel-Baky**, samy.abdel-baky@basf.com, Jay Jones, Detlef Dohnert, Manasi Saha, Adam Finch, and Jane M. Stewart, BASF Corporation, Research Triangle Park, NC 27713*

Today, more than ever, laboratories are competing to reduce the cost of the analyses and lab wastes. “Micro-Technology and Automation” (MTA) was developed at BASF, RTP, NC to allow for high throughput residue analysis (96 samples/day/analyst). A 96-well plate format is utilized to miniaturize/analyze for residues in plants, water, soils and post consumer resin (PCR). With this technology, a bulk field sample is reduced to a representative 0.1 gram of fine powder (particle size <400 µm). Smaller aliquots enable the use of simpler and more automated extraction techniques and clean-up procedures. MTA has been incorporated in many analytical methods to analyze for residues in plants, soil, water and PCR samples. Additionally, MTA represents “green residue lab” by reducing the solvent usage/waste by about 90%, and allowing for fast turn around for analysis in emergency cases. The development/implementation of this technology will be presented.

AGRO 40
Green residue chemistry: High throughput in residue analyses for soil, water, and plant samples utilizing micro-technology and automation
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Laboratories are constantly looking for new ways to reduce costs and to improve the productivity and efficiency of residue analyses. It is still a challenge to conduct analyses of thousands of samples collected in the field or throughout the food value chain with a fast and rugged method. To achieve this goal , cost effective and efficient methods were developed by BASF at Research Triangle Park, North Carolina, applying a “Micro-Technology and Automation” (MTA) technique using small sample sizes (0.1 g) with detection of active ingredient and metabolites with a limit of quantitation of 0.01 mg/kg in soil, water and plant matrices. MTA methods were proven to be robust and cost effective (96 samples/day/analyst). MTA represents a “green residue lab” by reducing solvent usage/waste by about 90%. The analytical methods and their use in residue analyses will be presented.

AGRO 41
Multiresidue analysis for pharmaceuticals, polar pesticides, and related compounds: SPE and UHPLC considerations
***Michael S. Young**, michael_s_young@waters.com and Jeremy C. Shia, jeremy_shia@waters.com, Waters Corporation, Milford, MA 01757*

Although pharmaceuticals and related polar contaminants were first quantified in European surface and groundwater supplies over ten years ago, interest in this issue in the US has increased only in the last few years. For example, in 2007, an EPA protocol (EPA 1694) was issued for determination of veterinary pharmaceuticals in water, soil and sludge samples. In this presentation we will discuss improved SPE strategies for determination of veterinary drugs and polar pesticides in various matrices. Because the compounds of interest encompass a wide spectrum of polarities, seldom can any one SPE sorbent be suitable for all compounds. However, using mixed-mode SPE, the majority of analytes can be determined in one experiment. These cleanup and enrichment strategies will be discussed with subsequent UPLC analysis in mind.

AGRO 42
Analytical method for the determination of chlorate in animal matrices
***D. J. Smith**, david.j.smith@ars.usda.gov, Biosciences Research Laboratory, USDA-Agricultural Research Service, Fargo, ND 58105, P. B. Bahnson, University of Wisconsin, School of Veterinary Medicine, Madison, WI 53706, and J. B. Taylor, USDA-Agricultural Research Service, US Sheep Experiment Station, DuBois, ID 83423*

Contamination of meat products with gram-negative enteric pathogens contribute to over 1.5 million food borne illnesses each year. Recent studies have demonstrated 2-3 log unit

reductions in numbers of *E. coli* O157:H7 and (or)*Salmonella* in food animals dosed with an experimental chlorate-containing product. Sensitive and specific analytical methods for chlorate in food animal tissues or in gastrointestinal fluids do not exist, but would be useful. To this end, an analytical method specific for chlorate in animal matrices was developed. The method involves fortification of samples with ^{18}O-chlorate internal standard, extraction of chlorate in water, solid-phase extraction cleanup of the aqueous phase, dilution with water, and analysis by LC-MS-MS using either triple-quadrapole or quadrapole-time-of-flight detection. Across three analysts, recoveries of chlorate in fortified swine feces and sheep serum (51 to 2500 ng/g) ranged from 99 to 110% and 95 to 104%, respectively. Blank matrices showed no significant interferences. Analyses of gastrointestinal tissues from hogs dosed with chlorate salts were highly repeatable.

AGRO 43
Don Wauchope and friends: Reflections on the future of pesticides environmental chemistry
***Julius Menn**, USDA-Agricultural Research Service (retired), Rockville, MD 20852*

It is a great honor and distinct pleasure to open the award symposium honoring and recognizing a great environmental scientist and person, Robert Donald Wauchope, known to his friends as Don. In an illustrious career spanning over 35 years in the USDA, Don's contributions became landmarks in environmental chemistry of pesticides. To mention a few salient highlights: Identified arsenicals as indicators of environmental pollution, profiled pesticides in soils as non point pollutants of water. His seminal publication in 1978;"The pesticides content of surface water draining from agricultural fields", became the guideline for all practitioners in the field. Don further solidified his scientific leadership in the field through his seminal publications detailing pesticide properties databases. Don's energetic personality, was also evident in the many international symposia and task forces that he led in the environmental arena. I was fortunate to meet and learn to appreciate Don's intellect and scientific judgment when we served on the Editorial Board of "Pest Management Science". I am most happy and honored to have participated in launching the recognition award for a great scientist, a wonderful person and friend.

AGRO 44
Award address: The environmental chemistry of agricultural pesticides
***R. Don Wauchope**, Wauchope@citcom.net, USDA-Agricultural Research Service (retired),Pisgah Forest, NC 28768*

I review my career of 34 years with the USDA-Agricultural Research Service. After degrees in chemistry from UNC and NCSU and a post-doc at the school of "agricultural chemistry" pioneered by Virgil Freed at Oregon State, I was hired by plant physiologist Charles Swanson of the ARS Southern Weed Science Laboratory in Stoneville, MS to study the field behavior of arsenical cotton herbicides. Later, under the visionary leadership of Weed Scientist Chester McWhorter, this program broadened to a wide range of herbicides, including the first runoff studies using simulated rainfall. During this period I wrote a review of pesticide losses in agricultural runoff which became the standard reference on the subject. In 1984 I transferred to the Southeast Watershed Research Laboratory in Tifton GA, working with Ralph Leonard of GLEAMS model fame, and also for a time in the nematology and weed science unit under Bill (A. W.) Johnson. I contributed pesticide algorithms to the GLEAMS, RZWQM and REMM ARS simulation models and developed a useful pesticide property database. I'm still active in database development, still attempting to answer the question posed to me by McWhorter in 1976: "How much of the behavior and fate of pesticides in the environment can be predicted from their physical and chemical properties alone?"

AGRO 45
Research and development of agrochemicals over the past 40 years
***John B. Unsworth**, unsworjo@aol.com, Consultant, 25 Vellacotts, Chelmsford, United Kingdom*

Over the past 40 years there have been significant changes in the tools available for the research and development of agrochemicals. Research has gone from "spray and pray" to High Throughput Screening on *in vitro* targets. Analytical techniques now allow easier identification of metabolites and degradation products, whilst parts per trillion can be routinely determined. These changes have been largely driven by advances in computing power over the past decades. Similarly, the modelling that can now be carried out would have seemed impossible 40 years ago. Information today is also much more readily accessible than before, the Internet is a tool which has come of age and is the repository of a large amount of information. Communications have similarly changed with e-mail allowing instant communication with fellow scientists. The presentation will look at these various factors from a personal point of view and their effect on agrochemical research and development.

AGRO 46
Chemicals and chemistry in agriculture and the role of USDA-ARS
***Cathleen J. Hapeman**, cathleen.hapeman@ars.usda.gov, Beltsville Agricultural Research Center, USDA-Agricultural Research Service, Beltsville, MD 20705*

The production of food, feed, fiber, and now fuel to meet the needs of the US citizenry and the world in the 21st century and beyond while preserving our natural resource base will require bold, visionary, and highly-collaborative research. Economic considerations will provide additional incentive to develop innovative strategies to tackle agriculture's most-challenging issues. Understanding the chemical processes in the ecosystem components of soil, water, air, and biota will lead to effective agronomic practices. Pest control is no longer just about pesticides and their use, but understanding the chemistry and chemicals of attraction mechanisms and of life cycle changes. As detection and measurement technologies become more robust and sensitive, allelopathic compounds in organic cover crops systems are emerging as valuable control/suppression compounds. Development of biopesticides and RNAi strategies will provide creative chemical control of deleterious organisms and invasive species. Rigorous life cycle analysis (LCA) of biofuels will demand complex chemical modeling to ensure that our environmental health is not compromised. For ARS to meet the new agricultural paradigm, researchers must have the flexibility and courage to embark on these ambitious and long term missions.

AGRO 47
Environmental research in the USDA-ARS Southern Weed Science Laboratory, Stoneville, MS: Pool tables to 21-gun salutes
***Martin A. Locke**, martin.locke@ars.usda.gov, National Sedimentation Laboratory, USDA-Agricultural Research Service, Water Quality & Ecology Research Unit, Oxford, MS 38655, and Robert M. Zablotowicz, robert.zablotowicz@ars.usda.gov, Southern Weed Science Research Unit, USDA-Agricultural Research Service, Stoneville, MS 38776*

A strength of the USDA Agricultural Research Service (ARS) is the ability to sustain long-term research with a national

perspective. Over 35 years ago when the ARS Southern Weed Science Laboratory was established in Stoneville, MS, interest in environmental issues relative to weed management was minimal. At that time, researchers such as Don Wauchope studied the effects of arsenical herbicides and were the first there to study herbicide behavior in soil and non-target impacts on crops. These studies were not always popular with growers, but they helped to develop basic concepts about herbicide fate under Mississippi Delta conditions. The environmental team in the Southern Weed Science Research Unit has continued to contribute significantly to knowledge concerning herbicide fate and potential impacts in soil and water. The research has evolved with the times, expanding from primarily laboratory research to field and watershed studies addressing issues such as conservation tillage, transgenic crops, water quality, and enhanced herbicide degradation in soil.

AGRO 48
Innovations of agrochemicals and IPM
***Keiji Tanaka**, Keiji.Tanaka@mitsui-chem.co.jp, Mitsuichemical-Agro, Research Institute, 894, Yasu, Yasu-shi, Shiga-ken, Japan, Fax: 81-77-588-3281*

At the 1992 UNCED Earth Summit in Rio and at the 1998 FAO World Food Summit in Switzerland “Sustainable agriculture” was discussed in order to feed a growing world population in an environmentally and socially sensitive manner, maintaining farmer's natural resource base for future generations. Many innovations for the sustainable agriculture have been brought about to protect crops and increase their yields, crop rotation, crop selection, fertilizer, chemical control, biological control, physical and mechanical control, transgenic crop and so on. Integrated Pest Management (IPM) and Integrated Crop Management (ICM), which are playing an important role on modern and future agriculture for crop production, are strongly based on these technologies and methods. At this symposium several innovations of agrochemicals and their relating technologies in Japan will be shown and discussed in connection with their risk reduction and the sustainable agriculture.

AGRO 49
Advice to the public on using repellents
***Daniel Strickman**, Veterinary and Medical Entomology, USDA-Agricultural Research Service, George Washington Carver Center, Beltsville, MD 20705-5148*

The public attempts to prevent the bites of arthropods by using any of hundreds of products applied to the skin. These topical repellents contain either botanically-derived or synthetic active ingredients. The correct application format, active ingredient, and formulation can make a big difference to the consumer, who may have a list of preferences based on much more than effectiveness. Liquids, lotions, and sprays are the most common formats, but there are also towlettes, roll-ons, and sticks. Choice of active ingredient can depend on perception of toxicity, potential for skin irritation, odor, effectiveness against a particular pest, and tactile qualities. Formulation affects duration, skin feel, and odor. Finally, cost per application and per hour of protection varies widely, further affecting consumer choices.

AGRO 50
Molecular design and semi-field performance of highly selective carbamates for control of the malaria mosquito, *Anopheles gambiae*
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In the malaria mosquito, *Anopheles gambiae*, the ace-1 gene codes for acetylcholinesterase (AChE). Classical inhibitors of this enzyme (e.g., carbamates and organophosphates) display little selectivity for enzyme inhibition, typically < 4-fold. Recent experimental and molecular modeling studies identified carbamates having 100- to 1000-fold selectivity for malaria mosquito AChE compared to human AChE. Insecticidal activity was assessed in semi-field studies in Africa. When bednets were soaked in an ethanolic solution of 3-tert-butylphenyl-N-methylcarbamate, control extended out over 50 days. We anticipate that field activity will be greatly prolonged using conventional formulations. These new molecules have unprecedented potential as leads to safe, effective mosquitocides in the fight against malaria.

AGRO 51
Antiparasitic isoxazoline: Novel chemistry of ligand-gated chloride channel (LGCC) blockers
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Isoxazoline A1443 has antiparasitic activity to cat fleas and ticks. The activity is comparable to that of the commercial ectoparasiticide fipronil. To study the mode of action of the isoxazoline, we utilized cDNAs encoding housefly GABA- and glutamate-gated chloride channels (termed MdRDL and MdGluCl, respectively). In two-electrode voltage clamp electrophysiology using Xenopus oocytes expressing MdRDL or MdGluCl channels, the isoxazoline blocked GABA- and glutamate-induced chloride currents with IC50s comparable to those of fipronil. The potency in blocking MdRDL channels was two orders of magnitude higher than that in blocking MdGluCl channels. In inhibition of [3H]4'-ethynyl-4-n-propylbicycloorthobenzoate binding to housefly head membranes, the isoxazoline (racemate) was one order of magnitude more potent than fipronil. The results indicate that the isoxazoline is a novel LGCC blocker.

AGRO 52
Biological activity of pyrethroid-impregnated paint upon *Daphnia magna*
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Dengue virus is transmitted by *Aedes aegypti* mosquitoes. Reducing the contact with mosquitoes will diminish transmission of the disease. Our aim is to develop a method to repel and/or kill the mosquito vector. We did a

preliminary screening of chemicals and then carried out a definitive evaluation of a pyrethroid impregnated in paint. At this time, we are assessing the impact effect in the environment. Some of our laboratory partners evaluated the effects upon dicotyledonous and monocotyledonous plants. Others evaluated the effect upon the mosquitoes themselves. Our aim is to evaluate the effects of the pyrethroid impregnated paint upon Daphnia magna, a small, planktonic crustacean used as a model to assess the toxicological effects on the environment. Data will be shown to demonstrate the effects of these pyrethroids upon the environment.

AGRO 53
Safety evaluation of newly developed carbamate insecticides
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Malaria control is more difficult because of increasing insecticide resistance of its insect vectors, so new mosquitocides are needed. Recombinant mouse and human AChE samples are potential substitutes for homogenized mouse AChE sample for toxicity evaluation. We found that newly developed carbamate insecticides match the properties of commercial carbamate insecticides both chemically and biologically, based on chemical structure and IC50 regressions. Further experiments demonstrate that these new carbamates show good selectivity (Anopheles gambiae IC50/mammal IC50), which ranges from 50- to 2533-fold for recombinant mouse enzyme and from 57- to 5420-fold for recombinant human enzyme, whilst that of commercial carbamates are from 0.5- to 28-fold, respectively. This series of experiments indicate that these newly developed carbamate insecticides offer a good option for malaria control, because of higher toxicity and selectivity to its vector compared to established compounds.

AGRO 54
Development of EXPRESS modeling platform
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EXPRESS (EXAMS – PRZM Exposure Simulation Shell) is a user-friendly input/output shell to facilitate running the linked USEPA Pesticide Root Zone Model (PRZM) and Exposure Analysis Modeling System (EXAMS) environmental fate and transport models. It is a joint endeavor of the USEPA Office of Pesticide Programs (OPP) and the EPA Office of Research and Development (ORD). OPP is responsible for the development and maintenance of the crop-specific modeling scenarios and maintenance of the software. ORD was responsible for development of the software and continues to provide online public availability of the program. EXPRESS is designed to facilitate rapid, consistent assessment of aquatic pesticide exposure of a variety of crops.

AGRO 55
Recent code enhancements to the pesticide root zone model (PRZM): Linked watershed modeling and harmonization with FOCUS models
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Two recent code enhancement efforts were undertaken on the Pesticide Root Zone Model (PRZM). The first involved improving PRZM's utility for watershed modeling. The second involved harmonization/addition of several algorithms in PRZM to improve agreement with the FOCUS models PEARL, MACRO, and PELMO. A discussion of these code changes and their use are presented. Six primary changes were made to PRZM, three for each the watershed and the harmonization. Watersheds enhancements are as follows: 1) a new sub-lateral flow routine to more closely represent tile drainage, 2) the ET routine was changed to allow the use of FAO irrigation and drainage paper 56 based technology, and 3) PRZM enhanced for use as a run-on/run-off buffer model. The harmonization enahncements are as follows: 1) addition of aged sorption kinetics, 2) user defined dispersion lengths, 3) addition of a daily irrigation file.

AGRO 56
A new PRZM algorithm for predicting biphasic degradation of pesticide in soil using coupled time-dependent sorption and degradation kinetics: Model-data evaluation
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In the first part of this two-paper series, a mathematical approach coupling time-dependent sorption with degradation kinetics was described as several competing processes between the adsorbed phase and soil pore water. The adsorbed phase is assumed to have two types of sorption sites (or pools), with one adsorbing compound instantaneously and the other time-dependently. This approach has been implemented in PRZM Version 4 (PRZM4) and has shown the ability to predict the bi-phasic degradation/dissipation patterns often observed in laboratory and field dissipation studies. In this paper, we present results of a model evaluation exercise involving data obtained from more than 40 field soil residue studies across a wide range of geography and environmental conditions. The data set was divided into a model “training” subset and a model validation subset. Data in the training subset were used to calibrate PRZM4 for the required sorption and degradation parameters. The calibrated model was then run to independently predict the observed data in the validation subset, with the calibrated parameters held constant. The inclusion of time-dependent sorption in PRZM4 resulted in significant improvements to the predictions of soil surface residues.

AGRO 57
Quantification of fungicides in snow-melt runoff from turf: A comparison of four extraction methods
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A variety of pesticides are used to control diverse stressors to turf. These pesticides have a wide range in physical and chemical properties. The objective of this project was to develop an extraction and analysis method for quantification of chlorothalonil and PCNB (pentachloronitrobenzene), two pesticides with dissimilar Kow's, in snow-melt runoff from turf managed as a golf course fairway. The efficiencies of 4 extraction methods were compared: automated SPE with C18 cartridges, C18 sorbent filter disks, stir bars coated with polydimethylsiloxane, and LLE using dichloromethane. Extracts were analyzed using GC-MS. Extraction by automated SPE and LLE resulted in >80% extraction efficiency for both pesticides. Passive extraction using sorbent disks was less efficient, ~70% for PCNB and ~40 % for chlorothalonil. There was negligible sorption onto the sorptive stir bars for both chemicals. In addition to extraction efficiency, cost, time, and ease of use must also be considered when planning for large scale experiments.

AGRO 58
Use of readily available geospatial information to demonstrate similarity of a European soil to soils found in the United States
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Reviews of data packages submitted for pesticide registration are increasingly shared among regulatory agencies including United States EPA, Canadian PMRA, Australian APVMA, and European authorities. To facilitate data sharing for environmental fate soil studies supporting risk assessments, the relevance of a soil tested from one region to those of another should be determined. An anaerobic metabolism study conducted using a German soil was submitted for review at EPA and PMRA. Relevance of the German soil to soils in the United States was assessed by a web based desktop exercise using freely available geospatial mapping from the Natural Resources Conservation Service, Google maps, and United States and German weather data. A USDA taxonomic classification was developed for the German soil and the extent of similar soils in the United States was determined. This process may be useful in development of a European to United States soils "cross-walk".

AGRO 59
Pre-Serve: A web-based mapping application for the delivery of geographically-specific pesticide mitigation instructions
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Humanity is faced with the increasingly difficult challenge of meeting the world's growing needs for food, feed, fuel, and fiber in an environmentally sustainable manner. Herbicides are an important tool for growers; however, geographically-specific mitigation instructions may be appropriate to address environmentally sensitive areas, including threatened and endangered species habitat. Monsanto Company has partnered with Stone Environmental to develop an interactive web-based mapping program used by growers to determine if their fields fall within areas that may potentially impact threatened and endangered species. Development of this website involved extensive spatial analysis of land use, cropping practices, and other information to identify areas potentially requiring mitigation. These datasets were assembled into an ArcSDE spatial database and integrated with additional web-mapping services through an ArcGIS Server mapping application. The web tool allows users to choose one of several methods to identify the location of their field and print any applicable geographically-specific mitigation instructions.

AGRO 60
Acetochlor stewardship
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In the late spring of 2009 the acetochlor stewardship program website underwent significant changes. In addition to new look, updated use, safety and application information, the website now also includes a state-of-the art dynamic mapping application. This mapping application enables stakeholders to view any known geographic area with potential acetochlor use information in the U.S. Not only are restricted areas shown, the map viewer also shows regions with limited or no use restrictions. The mapping application, built using ArcGIS Server® technology embeds Google Maps® and provides an easy-to-use interface. The interface allows users to quickly navigate to a county, or specific geographic coordinates of interest. The map depicts Google Maps imagery and transposes soils with known restrictions. A custom print function allows the users to print maps depicting the soils with application restrictions, and share them with farmers and applicators alike.

AGRO 61
Air-water gas exchange of currently used pesticides in the Canadian arctic
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Occurrence of chemicals in remote regions is recognized as evidence of long-range transport under international protocols to control persistent, bioaccumulative and toxic substances. Currently used pesticides (CUPs) are generally less persistent that the older organochlorines but they can still undergo atmospheric transport and have been reported in air, seawater, snow and ice of arctic and subarctic regions. This paper summarizes measurements of CUPs in air and water of the Canadian Archipelago, made on expeditions during 1999 and 2007-08. CUPs identified were endosulfan, dacthal, chlorothalonil, chlorpyrifos and trifluralin. Estimates of air-water gas exchange, using available Henry's law constants, suggested net deposition for most compounds.

AGRO 62
Ammonia emissions from feedlot surface of beef deep-bedded monoslope facilities
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The objective of this study was to determine spatial and seasonal variation for ammonia emitted from the surface of beef deep-bedded monoslope facilities. Four pens (27.5 x 30.5 m) in two commercial beef deep-bedded monoslope facilities were studied. In each pen, ammonia was collected in acid traps at 56 locations using flux chambers with a surface area of 640 cm^2. To obtain data at multiple time points during each season, samples were collected at 6-week intervals from March to December 2008. Time series data was collected on two separate days at time 0, 4, and 10 hrs to determine the length of time necessary to reach baseline ammonia emissions after cattle removal from the pen. There was no consistent spatial pattern of ammonia emissions. Ammonia emission rate decreased rapidly (< 4 hr) after cattle were removed from pens. Seasonal effects were observed with winter consistently lower than spring or summer.

AGRO 63
Open-path micrometeorological methods for measuring methane gas emission from agricultural sites
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In this study, we evaluated two relatively new micrometeorological techniques for their accuracy and applicability; vertical radial plume mapping (US EPA OTM-10) and the backward Lagragian stochastic (Wintrax®) techniques. A scanning open-path tunable diode laser mounted on an automatic scanning device was used to collect path-integrated concentrations (PICs) along different optical paths on a vertical plane downwind of controlled methane releases for the OTM-10. One of these downwind PICs was also used to run Wintrax®. Atmospheric stability and the surface layer were characterized with the parameters estimated from both 3-D sonic anemometer and profile methods. The OTM-10 was able to estimate the known methane emission rate with less than 20% error. The accuracy of the backward Lagrangian stochastic method under similar setting is under investigation at this time, and will be presented at the meeting.

AGRO 64
Development of VOC quantitation methods for livestock barns
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It is important to establish a reliable VOC sampling and analysis method for samples taken from livestock production operations and to understand VOC emissions. As part of the National Air Emissions Monitoring Study (NAEMS), we established a method of VOC analysis for dairy, swine and poultry barns. A Thermal-Desorption-System (TDS)-GC-MS method was developed for analyzing and quantitating samples by passive canisters or TDS tubes. A total of 57 major compounds observed at the farms were quantitatively analyzed, and additional minor components were positively identified by their chemical structures. Concentrations of VOCs in barns were calculated in conjunction with barn airflow rates measured in the NAEMS. The primary analysis of the samples proved that the method is effective, but more work is needed to improve it.

AGRO 65
Diet effect on the type and spatial distribution of odorous emissions from beef cattle
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This study evaluated odorous emissions from beef cattle waste resulting from being fed either a corn-based or a wet distiller's grain with solubles (WDGS) diet. Analyses included using remote-sensing technologies to determine pen surface spatial distributions. Finishing steers, 45 head per pen, total of 8 pens, were fed either a diet of 0 or 40% WDGS; four pens per treatment. Odor potential was determined by mixing 350 g surface sample with 700 ml distilled water from 20 sites per pen and incubated at room temperature for three days. Slurry samples were analyzed for volatile fatty acid (VFA) compounds following incubations. Remote sensing techniques were combined with multi-linear regression of VFA characteristics at day three to determine pen surface spatial distributions of these compounds. Preliminary analysis indicated greater potential branched-chain VFA production with WDGS than corn-based diets. Additional analysis will investigate the types of branched chain VFA production based on diet.

AGRO 66
Distinguishing sources and fate of atmospheric reactive nitrogen and particulate matter using stable isotopes
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Reactive nitrogen emissions, including NO_x and NH_3, are significant contributors to global water and air quality degradation and particulate matter emissions have deleterious impacts on human heath, air quality, and visibility. The isotopic composition of major sources of NH_3 (δ^{15}N-NH3), NO_x (δ^{15}N-NOx), $PM_{2.5}$, and PM_{10} (δ^{15}N, δ^{13}C, and δ^{34}S) will be characterized to aid in distinguishing emission source contributions. Taking place in summer 2009, this work will focus on agricultural regions, forest management areas, and areas of intensive fossil fuel emissions including the Beltsville Agricultural Research Center (BARC), Beltsville, MD, the Konza Prairie Long Term Ecological Research program (LTER), KS, and Pittsburgh, PA. Active and passive sampling approaches will be employed for comparison of isotopic values from each approach. Ogawa passive samplers will be deployed to collect NH_3 and NO_2 and a MetOne Multiple Event Speciation Aerosol Sampling System (SASS), an active sampler, will be deployed to collect NH_3, NO_x, $PM_{2.5}$, and PM_{10}. A Thermo Chemiluminescence NO-NO_2-NH_3 analyzer (TCA) coupled with a flux chamber will also be deployed to measure biogenic NO_x and NH_3 at each site for comparison with isotopic values. It is expected this work will provide the most comprehensive assessment to date of the isotopic composition of major sources of NH_3, NO_x, $PM_{2.5}$, and PM_{10}. This work will build a foundation for future research that utilizes the isotopic composition of NO_x and

NH_3 sources to trace NOx and NH_3 emissions across landscapes and to trace the transport of NH_3 across regions.

AGRO 67
Measurement of ammonia, nitric acid, sulfur dioxide, and sulfate (PM2.5) fluxes over soybeans using the modified Bowen-ratio method
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A modified Bowen-ratio system was deployed near Lillington, North Carolina in early fall 2006 to measure the air-surface exchange processes of nitrogen and sulfur species over a mature soybean crop. Annular denuders and filter packs, which captured ammonia (NH_3), nitric acid (HNO_3), sulfur dioxide (SO_2), and $PM_{2.5}$ sulfate (SO_4^{2-}), and sonic anemometers were arranged at heights of 1 m and 4 m. Fluxes for each species varied between emission and deposition. Sulfur species had more consistent flux values during the experiment while nitrogen species varied greatly and were seemingly more dependent on canopy conditions.

AGRO 68
Food defense activities for production of catfish products
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Food defense in the food and agriculture sector includes identification of vulnerabilities and counter-measures against intentional contamination of food products during production, processing and distribution. Intentional contamination with toxic chemicals, harmful pathogens and radiological agents has the potential to create mass casualties and damage to economies. The 2008 Farm Bill includes a statute specifically requiring the United States Department of Agriculture's (USDA) Food Safety Inspection Service (FSIS) to begin an inspection program for domestic catfish production, processing and transportation. In addition, it also requires that foreign-raised catfish be produced under the programs deemed equivalent to the U.S. While an important part of catfish inspection is to ensure food safety, it is also imperative that food defense is considered and appropriate measures are implemented. Food defense goals include preventing an attack, responding to and recovering from an attack and rapidly restoring public confidence. As modified by FSIS and the Food and Drug Administration (FDA), the CARVER+Shock [Criticality, Accessibility, Recuperability, Vulnerability, Effect and Recognizability] tool has been used to identify production and processing steps, i.e. nodes that present possible vulnerabilities and thus potential targets for a terrorist attack. In the assessment conducted by FSIS on the pond-to-plate paradigm of catfish production, the CARVER +Shock tool identified vulnerabilities in the system to an intentional attack and potential countermeasures. The catfish production system included three subsystems, namely, fish cultivation in ponds for the production of food fish, processing of fresh fish into several products, including value added products, and distribution to various points of consumption. Each subsystem was found to contain several complexes. The complexes were further broken down to components and then components to nodes. The assessment then identified components and nodes of possible concern. This presentation describes general unclassified food defense issues related to catfish production.

AGRO 69
Evaluation of a new natural product herbicide for rice weed control
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Thaxtomins (4-nitroindol-3-yl-containing 2,5-dioxopiperazines) are a group of natural product phytotoxins produced by microbes of the genus *Streptomyces*. In preliminary tests, thaxtomin A, a metabolite produced by *Streptomyces scabiei*, an actinomycete isolated from a marine environment, has shown high levels of crop selectivity and potential utility in weed control on rice. In a greenhouse study where thaxtomin A at 0 - 0.4 mg/mL was applied to four common rice weeds: *Ammania* sp. (redstem), *Alisma plantago-aquatica* (common waterplantain), *Cyperus difformis* (smallflower umbrella sedge), and *Leptochloa fascicularis* (sprangletop), thaxtomin A at 0.2 mg/mL provided good control (70%) of redstem and excellent control of common waterplantain (100%) and sedge (90%). No phytotoxic effects were observed in rice plants treated with the same concentrations of thaxtomin A, which suggests that thaxtomin A could be used alone and in combination with other rice herbicides to control weeds in both organic and conventional rice.

AGRO 70
Diversity of herbicide transformation-product concentrations in the Shenandoah River watershed indicates differences in microbial and geological influences in basins surrounding streams
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Atrazine (2-chloro-4-ethylamino-6-isopropylamino-*s*-triazine) can be transformed into six major products either abiotically through photolysis or hydrolysis, or biologically by either atrazine chlorohydrolase or by cytochrome P450 monooxygenases found in ubiquitous soil bacteria. Atrazine transformation products may have the same toxicological effects as atrazine such as toxicity to algae and microinvertebrates or increased aromatase transformation of testosterone to estradiol in aquatic species. Exposure to transformation products has delayed puberty in rats further underlying toxicological potential to aquatic ecosystems. Water samples from Shenandoah River basin streams were collected over twelve consecutive months, filtered, extracted and analyzed for atrazine and its transformation products using solid-phase extraction and LC-MS. Relative transformation-product concentrations were correlated to different geological and microbiological characteristics in local stream basins.

AGRO 71
Development of quantitative LC/MS/MS method for glyphosate residue analysis
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A sensitive and specific LC/MS/MS method was developed for quantitative analysis of glyphosate in various raw agricultural commodity matrices. An Agilent 1200 liquid chromatography system coupled to an Applied Biosystems

triple quadrupole Mass Spectrometer (API4000) with TurboIonSpray was utilized for this analysis. Based on quantitative optimization, multiple reaction monitoring (MRM) for glyphosate was performed in positive ion ESI mode. Reversed-phase liquid chromatography coupled with electrospray ionization tandem mass spectrometry (LC/MS/MS) allowed the quantitation of residues of glyphosate in various agricultural and food samples. Substantial savings in time and labor was achieved by extracting the raw agricultural materials in batches using a bead beater technology rather than using mechanical probes. Such extractions in a batch mode used sample sizes smaller than the norm for residue methods. A liquid-liquid extraction followed by protein precipitation or solid phase extraction was performed before the LC/MS/MS analysis. This method is simple, specific and efficient.

AGRO 72

Effect of olive-mill waste addition to soil on sorption, persistence, and leaching of the herbicide fluometuron

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Organic amendment addition to agricultural soils is an agronomic practice that can greatly affect the behavior of pesticides. Olive-mill waste (OMW) is an organic residue generated in great amounts in olive oil producing countries, and its addition to agricultural soils has been proposed as an alternative for its disposal and to increase soil fertility. In this work, we assessed the effects of OMW addition to two agricultural soils (clay and sandy loam) on the sorption, persistence, and leaching of the herbicide fluometuron. Batch sorption experiments indicated that addition of OMW at rates of 1, 2, and 5% (w:w) increased the sorption of fluometuron in both soils. The increase in sorption was more pronounced for the sandy loam soil than for the clay soil. Incubation experiments and column leaching tests revealed that OMW addition to both soils increased the persistence and retarded the leaching of fluometuron. These results indicate that OMW addition to agricultural soils can significantly affect the behavior of fluometuron and that these effects should be considered to optimize the performance of the herbicide in amended soils.

AGRO 73

Physiological and yield response of transgenic and nontransgenic corn to glyphosate

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A field study investigated physiological and yield responses of transgenic glyphosate-resistant (GR) and GR stacked with glufosinate-resistant (GR/LR) corn to label rates of glyphosate, and conventional (CONV) corn to a drift rate of glyphosate. Glyphosate at 0.84 or 1.26 kg ae/ha was applied twice at 3 and 6 weeks after planting (WAP) to transgenic corn. Glyphosate at 0.105 kg ae/ha was applied once at 3 or 6 WAP to CONV corn. Glyphosate caused injury and increased shikimate levels in CONV corn but not in transgenic corn. Glyphosate decreased leaf N content in CONV corn. Glyphosate reduced nitrate reductase activity in leaves in all three genotypes with severe reduction (47-78%) noted in CONV corn. Glyphosate had no effect on grain N content in all three genotypes. Glyphosate reduced yield (6-54%) in CONV corn with greatest reduction when applied at 3 WAP. Yields were not affected in transgenic corn, regardless of glyphosate rate.

AGRO 74

Use of DNA adduct biomarkers as measures of susceptibility of vegetable plants to oxidative and genotoxic stress from pesticides

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In earlier work we have demonstrated that detection of modified nucleotides can be utilized as a biomarker of oxidative and genotoxic stress in pesticide-treated crop plants. DNA adducts are formed between nucleotide bases in plant DNA and pesticide molecules, their metabolites, or other activated species. A variety of direct and indirect adducts have been observed and quantified for a diverse group of pesticides for several crop species, including soybeans, tomatoes, corn, cucumber, and pumpkin. The presence of cyclic propanodeoxyguanosine derivatives of hexenal and 4-hydroxynonenal is evidence for the formation of these unsaturated aldehydes from lipid peroxidation of linolenic acid in planta, resulting from pesticide-induced production of reactive oxygen species. Susceptibility to such oxidative stress varies from one plant species to another and depends also on the particular pesticide involved. In addition to oxidative stress related adducts, the presence and quantity of direct adducts between plant DNA and pesticide molecules or their metabolites is a measure of potential genotoxic damage. In this study we show that these adducts are found in varying amounts depending upon the plant system and the pesticide involved. Tomatoes display significant resistance to both oxidative and genotoxic stress from pesticide application compared with other vegetable plants. Presence of radical inhibitors and antioxidants are suspected to be responsible for reduced risk in some plant species, such as tomato.

AGRO 75

Validation of an analytical method for the determination of N-nitrosoglyphosate in glyphosate formulations by high performance liquid chromatography with tandem mass spectrometry detection

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N-nitrosoglyphosate (NNG) is an impurity of toxicological concern sometimes found in technical grade glyphosate and various formulations containing glyphosate or its salts. The United States Environmental Protection Agency (USEPA) and other global regulatory bodies have set maximum allowable concentrations of NNG in glyphosate formulations and technical materials. In most instances, the maximum allowable concentration is 1 part per million (ppm). Analytical methods for the determination of NNG are sparse in the scientific literature. The polar nature of NNG does not lend itself to most conventional reverse phase or normal phase liquid chromatographic techniques. Cation exchange high performance liquid chromatography (HPLC) is the most commonly employed technique. This research was conducted to evaluate a unique reverse phase HPLC stationary phase coupled with tandem mass spectrometry detection. The developed method was successfully validated for accuracy, precision, ruggedness and linearity. The method limit of quantitation (LOQ) was established at 0.5 ppm.

AGRO 76

A green chemistry approach to targeting *Periplaneta americana*'s octopamine receptor 1.

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Concerns over the use of conventional insecticides/pesticides has increased over the past couple decades due to environmental and mammalian health concerns along with resistance to targeted insects. This has led to alternatives to control both economically and medically important arthropods. Insecticidal efficacy at the insects' octopamine receptor is ideal because the receptor is not found in mammals at a significant level. Octopamine, a biogenic/trace amine, exerts its physiological functions through G-protein coupled receptors (GPCRs). Co-evolution of plants with insects has led to plants adapting defensive mechanisms to repel herbivore, microbial, or viral attack. This is done via the production of essential oils that are composed of a variety of compounds, in particular various forms of terpenes. The presented research will focus on the development of a high-throughput screening system. Specifically, expression of a *Periplaneta americana* octopamine receptor in the yeast cell *Saccharomyces cerevisiae*. This system allows us to determine the identity and pharmacology of this receptor. This system may also be used to perform competitive binding using recombinant membrane preparations.

AGRO 77

Uptake and degradation of atrazine in switchgrass (*Panicum virgatum*)

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Atrazine is a widely used herbicide in agriculture. Non-point source (NPS) contamination of groundwater and drinking water may pose a significant threat to humans, wildlife, and the environment. Phytoremediation may provide a cost-effective strategy for reducing NPS contamination from agricultural runoff. Previous laboratory and greenhouse studies have shown that switchgrass (*Panicum virgatum*) and other prairie grasses can enhance atrazine degradation in soils. Degradation is partially a result of microbial processes in the rhizosphere. Degradation may also occur within the above-ground plant biomass, however the extent to which this occurs remains unknown. We hypothesize that switchgrass plants have the capacity for degrading atrazine. The goal of this study is to: 1) characterize the ability of switchgrass plants to accumulate atrazine from soils; 2) quantify the amount of degradation occurring in the above-ground plant biomass; and 3) quantify the amount of degradation occurring in the rhizosphere. Switchgrass seedlings were transplanted in autoclaved and non-autoclaved sand containing 10 ppm atrazine. Treatments were sacrificed on Days 0, 15, and 30. Sand and plant tissue were extracted via mechanical shaking and tissue grinding, respectively. The extracts were analyzed by GC-NPD to determine the concentration of atrazine and metabolites in sand and plant tissues. Autoclaved and non-autoclaved treatments were compared to differentiate between atrazine degradation occurring in the plant versus atrazine degradation occurring in the rhizosphere. This study will provide a better understanding of the capacity for P. virgatum to remediate atrazine in contaminated soils.

AGRO 78

Biochemical and toxicological assessment of newly designed insect acetylcholinesterase inhibitors against mosquito vectors and agricultural pests

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Increased prevalence of pyrethroid resistance requires new mosquitocides to control malaria. The compounds need high toxicity towards mosquito species and low toxicity toward non-target organisms. In this study, three mosquito species and two species of agricultural pests were tested with experimental carbamates being designed for use on insecticide-treated nets. The experimental carbamates have shown 100 – 1000 fold selectivity of *An. gambiae* enzyme over human AChE and an LD_{50} of 4 ng/insect. A similar degree of selectivity and toxicity was observed for the other three mosquito species studied. For example, the compound, 3-tert-butylphenyl-N-methylcarbamate yielded: *A. aegypti* $IC_{50} \leq 30$ nM and $LD_{50} \sim 4$ ng; *A. albopictus* $IC_{50} \leq 40$ nM and $LD_{50} \sim 5$ ng; *C. quinquefasciatus* portrayed an IC_{50} of 120 nM and an LD_{50} of 11 ng. Surprisingly, the lepidopteran *Ostrinia nubilalis* showed poor enzyme inhibition ($IC_{50} > 10^{-6}$), indicating unusual insect selectivity.

AGRO 79

Ciprofloxacin degradation by membrane anodic Fenton treatment

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Ciprofloxacin, a fluroquinolone antibiotic, is widely used in human and veterinary medicine. It has been detected in treated wastewater as well as surface water. Prevalence of low concentration ciprofloxacin may induce development and spread of bacterial drug resistance. Advanced oxidation processes such as Fenton treatment have been successful as good degradation methods for such antibiotics, and anodic Fenton treatment (AFT), an indirect electrochemical treatment, has been reported to degrade sulfonamide antibiotics efficiently. In this study, AFT was applied to the degradation of ciprofloxacin and did so effectively over a pH range from 3 to 7. The kinetics of degradation were different at high and low pH, and in order to elucidate these kinetics, reference compounds with similar structures, nalidixic acid and 1-phenyl piperazine, were studied using AFT. In addition, computations for reaction energies of different protonated forms of ciprofloxacin reacting with hydroxyl radicals were made. The effects of various initial ciprofloxacin concentrations, initial pH, Fenton reagent delivery rates and Fe^{2+}/ H_2O_2 ratio were studied to optimize treatment conditions. All results will be discussed.

AGRO 80

Clay-based formulations to reduce the environmental impact of the herbicide terbuthylazine

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Controlled release formulations of pesticides are receiving increasing attention as a way to reduce the environmental impact of pesticides after their application to agricultural soils. Natural and modified clay minerals have been proved

to be efficient adsorbents for many pesticides and, accordingly, they have been proposed as supports in the desing of pesticide slow release formulations. In this work, we prepared clay-based formulations of the herbicide terbuthylazine by supporting the herbicide on Fe(III)-treated Wyoming montmorillonite (SW-Fe) and hexadecyltrimethylammonium (HDTMA)-treated Arizona montmorillonite (SA-HDTMA). Despite both SW-Fe and SA-HDTMA displayed very high affinity for terbuthylazine, only SA-HDTMA retained the herbicide in a reversible, bioavailable form. Interaction of terbuthylazine with SW-Fe resulted in scarce bioavailability of the herbicide, thus limiting the usefulness of the adsorbent as a support for the slow release of the herbicide. We discuss how the nature of the clay-pesticide interaction mechanism can condition the performance of clays as supports in controlled release formulations of pesticides.

AGRO 81

Computational approaches elucidate how a glycine deletion enables plant protoporphyrinogen oxidase to resist herbicides

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Protoporphyrinogen oxidase (PPO) serves as the molecular target site of numerous chemical classes of herbicides. The deletion of Gly210 of the mitochondrial PPO of A. tuberculatus has been reported to cause increased resistance to PPO inhibitors. However, a mechanistic understanding of the consequences of this Gly210 deletion is lacking. We have conducted kinetic studies which confirmed that the resistant PPO strain was 100 to 500 times less sensitive than the wild-type PPO to herbicides. Molecular dynamics simulations of comparative protein models suggested that the deletion of Gly210 caused unraveling of the last turn of the α-8 helix, resulting in significant changes in active site topography, with the active site of the resistant enzyme wider by ~3 Å and ~25% larger in volume. The increased active site volume could support simultaneous binding of substrate and inhibitor, explaining the mixed inhibition observed for resistant PPO.

AGRO 82

DDA in chickens, a pilot study as a DDT biomarker

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DDA, [bis(*p*-chlorophenyl)acetic acid, CAS# 83-05-6], is a water-soluble metabolite of DDT. DDA is excreted rapidly after being formed in animals demonstrating an important detoxification pathway that has received little study. DDA is a potential biomarker for both humans and wildlife during active DDT exposure. A 4 d feeding study with chickens was done using non-toxic levels of DDT/DDD (100 and 1000 ppm in diet). Chicken feces were collected daily. DDTs (DDT/DDD/DDE) and DDA were detected with GC-MS in SIM mode. DDA was acid hydrolyzed and derivatized using pentafluorobenzyl bromide and diisopropylethyl amine for GC-MS analysis (method LOQ 1 ppb in feces). One to 3% of DDT ingested was excreted daily as DDA during active DDT administration. Less than 1% was excreted as DDE. DDA excretion decreased rapidly (within 2 days) after DDT feeding. DDA is excreted rapidly in feces and may be a useful biomarker of DDT exposure in birds.

AGRO 83

Determination of pesticide degradation in raw and processed foods

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Since the Food Quality Protection Act (FQPA) of 1996, concern about pesticide exposure and its health effects has become more widespread. Pesticide metabolites in urine have been used for decades as biomarkers of exposure to these compounds. However, because of the possibility of pesticides degrading in food before consumption, the use of these metabolites as biomarkers could be misleading. This research is designed to discover if people may be exposed to pesticide metabolites, and if so, how much. The rate of organophosphate pesticide and pyrethroid degradation has been studied as well. Two extraction methods have been used to evaluate degradation of pesticides in food. Although some pesticides tested degrade in at least some of the food matrices tested, others do not seem to degrade in these mediums, or at least not quickly enough to show a statistically significant change over the course of one week.

AGRO 84

Development of analytical techniques for the detection and quantification of erythromycin in environmental matrices

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The veterinary antibiotic, erythromycin, is used for disease prevention and growth promotion in livestock. The widespread use of veterinary antibiotics in agriculture has led to increased concern about environmental fate. In this study, analytical techniques to detect erythromycin in water and sediment were developed. Past studies indicate that erythromycin may demonstrate an affinity to bind to sediment. ^{14}C-erythromycin in sand and a sandy loam sediment pH 8.1 with 2.0% organic matter was extracted with various solvent systems to determine extraction efficiency in fresh and aged residues. Recovery of erythromycin from fresh sediment was 85% using sequential extraction with 30% 0.3 M ammonium acetate pH 7. Sediment samples were oxidized and bound erythromycin was quantified by LSC. Concentrations of erythromycin in sediment and water were analyzed by HPLC with radio-detection. Developing improved analytical methods for erythromycin may lead to better detection of this compound and other pharmaceuticals in the environment.

AGRO 85

Effects of monoterpenoids on $^{36}Cl^-$ uptake of central nerve cords in the American cockroach

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Monoterpenoids and their derivatives showed good insecticidal activities in the previous studies, but the mechanisms of their action as natural pesticides are not known yet. In this research, modulation effects on $^{36}Cl^-$ uptake of central nerve cords in the American Cockroach of three monoterpenoids (Pulegone, Thymol, and Carvacrol)

were studied in order to understand the reason of the toxicity of these monoterpenoids pesticides. In these three monoterpenoids, thymol and carvacrol at a concentration of 500 µM increased the $^{36}Cl^-$ uptake induced by 1 µM GABA dramatically. The potentiation of the Cl^- uptake can be inhibited by 10 µM picrotoxin, which is a specific inhibitor to the insect's GABA receptor. Another monoterpenoid, pulegone at 500 µM, had a little enhanced effect on the $^{36}Cl^-$ uptake induced by GABA. The increasing of the $^{36}Cl^-$ uptake showed that thymol and carvacrol are both positive allosteric modulators for the American Cockroach's GABA receptor.

AGRO 86
Highly selective carbamates for Anopheles gambiae acetylcholinesterase: Effects of pharmacokinetics on toxicity to mosquitoes
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With increasing emergence of insecticide resistance, development of new, effective, and safer insecticides is important in maintaining the chemical arsenal for mosquito control. We have synthesized N-methyl carbamates which have up to 1200-fold selectivity to An. gambiae AChE, compared to ca. 3-fold for propoxur. However, their toxicity was comparable to that of propoxur, so toxicity did not achieve the levels predicted by their enzyme selectivity. We evaluated the toxicity profiles of these carbamates with synergists to ascertain the role of metabolic enzymes in lowering toxicity. We observed up to 4-fold greater toxicity with both new and conventional carbamate standards; in both contact and topical toxicity assays. In microinjection studies aimed at bypassing the cuticle, a possible penetration barrier, we obtained up to 15-fold greater toxicity. On-going electrophysiological studies may explain the role of the blood brain barrier in toxicity of new carbamates.

AGRO 87
Induction and characterization of ion channels in Sf21 cells
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The goal of this research is to produce differentiated insect neurons from *Spodoptera frugiperda* (Sf21) ovarian cell lines. This procedure uses a culture of Sf21 cells and a mixture of differentiation agents to produce viable neurons. The most important property of these differentiated cells, from the perspective of insecticide discovery, would be the expression of ion channels and neurotransmitter receptors. A fraction of ecdysone-transformed cells (17%) showed elevated calcium-dependent fluorescence in response to a depolarizing pulse of K^+ ion, suggesting the presence of enhanced levels of voltage-sensitive calcium channels. Immunofluorsecence assays (IFA) will also use fluorescent tagged antibodies to label sodium channels in these differentiated cells. Characterization of ion channels or receptors of differentiated cells will provide researchers with an additional experimental platform for insecticide discovery and high throughput chemical screening.

AGRO 88
Reducing near-field agricultural fumigant emissions through changes in regional application practices
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A field-scale air monitoring evaluation was conducted in the fall of 2008 in Washington State to measure near-field emissions of methyl isothiocyanate (MITC) during and after pre-plant field fumigation by two putative reduced-emission application technologies. MITC emissions from shank injection with roller compaction and a modified low sprinkler height center pivot system (drizzle boom) were concurrently monitored on two-acre test plots. Over the 4-day experimental application/post-application timeframe, measured MITC air concentrations were observed to be approximately 10-fold lower for shank injection compared to drizzle boom. We also observed maximum measured air emissions from the drizzle boom application approaching 300 part per billion (ppb) compared to ca. 50 ppb by shank injection. The estimated emission flux from these two Pacific Northwest field reduce-emission field-scale demonstrations both indicate lower near-field MITC inhalation exposure to bystanders when compared to recent 2008 US-EPA Reregistration Eligibility Decision fumigant emission values used in modeling field-edge buffer zones.

AGRO 89
Tannin determination in tamarisk and other foliage
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Tamarisk (*Tamarix* spp.) is an invasive plant with low nutritional value that contains tannins to defend the plant against mammalian herbivores. Tannins (so-called antifeedants) are present in the foliage of many plants. In this study, we evaluated tannin variability in foliage of tamarisk and Western redcedar (*Thuja plicata*) using a modified version of a methyl cellulose precipitation assay. Using UV-Vis spectroscopy, tannins were quantified by measuring the change of absorbance at 280 nm resulting from selective precipitation by methyl cellulose. The tannin content of tamarisk foliage collected from 160 plants grown in a common garden displayed little variation and was not correlated with the latitude of the plant collection site. Analysis of 135 redcedar samples demonstrated that tannins are only a minor constituent in the plant defense arsenal of this conifer. Near infrared reflectance spectroscopy was also investigated as a method for tannin quantification using minimal sample preparation.

AGRO 90
Transport, distribution, and interaction of pesticides, nutrients, and select pathogens in the Choptank River
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The Choptank River is an estuary and tributary on the eastern shore of the Chesapeake Bay whose mouth is a tidal embayment spanning 2057 km^2. Approximately 60% of land use in the Choptank River watershed is agricultural, with large acreages of corn (*Zea mays*), soybean (*Glycine max*), wheat (*Triticum aestivum*), and barley (*Hordeum vulgare*). Much of the grain production supports small and medium-sized animal feeding operations, mostly poultry with some dairy and horse husbandry. Poultry houses' manure is

routinely recycled as a fertilizer on agricultural production fields. This study is investigating whether local agricultural activities influence the microbial ecology in four sub-watersheds of the Choptank River. We are determining the distribution, viability, and interaction of persistent agricultural chemicals, nutrients, and select freshwater and pathogenic bacteria normally found in the onsite streams and runoff from poultry houses. Data will also provide insight on the effectiveness of present mitigation projects.

AGRO 91

Comparison of furfural to common soil fumigants and other liquid nematicides in relation to their toxicity, ecological toxicity, and environmental fate

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Furfural is a USEPA registered pesticide that can be used in the control of root infesting nematodes and has the potential to be a substitute for soil fumigants and sterilants such as methyl bromide. Furfural is ubiquitous in nature and widely found as a natural component in raw and processed foods. It is Generally Recognized as Safe (GRAS) as a food flavoring agent and has also been used with significant environmental benefits as a new and effective crop protection agent. Characteristics such as acute toxicity, ecological toxicity, and environmental fate will be presented in a comparative assessment to evaluate the relatively new active ingredient and its end-use product, Multiguard® Protect, to other liquid nematicidal products and soil fumigants employed for similar uses.

AGRO 92

Development of guidance for evaluating and calculating degradation kinetics in environmental media

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Under the North American Free Trade Agreement (NAFTA), the U.S. Environmental Protection Agency (EPA) and Canada's Pest Management Regulatory Agency (PMRA) are working to create an aligned North American registration system for pesticides. As part of this effort, EPA and PMRA initiated a project to harmonize methods for describing pesticide degradation kinetics. The primary goal of this project is to develop recommended procedures for characterizing and quantifying pesticide persistence in environmental media. Consideration is given to existing scientific approaches and guidance, such as that used by the European Union. While environmental exposure models usually employ first-order kinetics to describe degradation, the results of laboratory experiments, especially biodegradation studies, often do not follow first-order decay. As a result, the application of first-order kinetic equations to such experiments is not always appropriate. In these cases, alternate kinetic models are explored. The paper discusses various mathematical and kinetic models/approaches for addressing these issues.

AGRO 93

Development of mosquito-selective acetylcholinesterase inhibitors to control the malaria vector, *Anopheles gambiae*: Comparative sequence and structure approach

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Malaria is a critical problem in sub-Saharan Africa that merits a multifaceted response: depletion of the malaria mosquito *Anopheles gambiae* represents one approach. Acetylcholinesterase (AChE) is a proven target for high efficacy anticholinesterase insecticides. However, widespread insecticide resistance, and poor selectivity towards humans limits their use to reduce the risk of mosquito-borne infections such as malaria. Comparative sequence and structural comparison of known homologues, such as human AChE (*h*AChE), as well as homology modeling are important tools utilized towards the development and redesign of new AChE inhibitors with exquisite selectivity for *Anopheles gambiae* AChE (*Ag*AChE), such as in Virtual Library *in-silico* screening studies. We will report our characterization of *Ag*AChE compared to *h*AChE and other non-target species. We will also compare the three-dimensional structures of *h*AChE with refined homology models of *Ag*AChE, and discuss their distinctive features. Finally, new insights towards the development of new *Ag*AChE-selective inhibitors will be discussed.

AGRO 94

Interactions of the herbicide quinclorac with a bioherbicidal strain of *Myrothecium verrucaria*

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We are developing the fungus *Myrothecium verrucaria* (MV) IMI Accession No. 3601690, as a bioherbicide for kudzu [*Pueraria lobata* (Willd.) Ohwi] and some other invasive weeds. We have found that MV spore and mycelial formulations cause rapid injury when applied to the foliage of these weeds, and MV formulations containing the herbicide glyphosate [*N*-(phosphonomethyl)glycine] can exhibit synergy. Several synthetic auxin-type herbicides are labeled for kudzu control. The auxin-type herbicide quinclorac (3,7-dichloro-8-quinolinecarboxylic acid) provides excellent control of some grass and broadleaf weeds including hemp sesbania [*Sesbania exaltata* (Raf.) Rybd. ex. Hill], but is not labeled for kudzu control. It is highly selective, but the basis for selectivity remains obscure, and its molecular mode of action is controversial and apparently differs in monocots versus dicots. In bioassays with hemp sesbania and in greenhouse tests using kudzu seedlings, sub-lethal concentrations of both MV and quinclorac (purity-98%) applied together caused additive and/or synergistic effects on seedling growth and mortality. We have also found in ultrastructural studies that MV alone caused a rapid (~ 1 h after treatment) detachment of the protoplast from the cell wall, accompanied by the appearance of broken off plasmodesmata that remained in the wall of kudzu tissues. These symptoms occurred prior to the appearance of fungal growth structures. Further characterization (*in planta* and at the ultrastructural level) of quinclorac and MV interactions and their roles in the development of infectivity, necrosis, and death of target weeds is ongoing.

AGRO 95
Long-term studies of preformed organophosphorous insecticide biomarkers in produce
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Trace levels of organophosphorous insecticides (OP) and their derivatives including dialkylphosphates (DAPs) occur in the diet. DAPs may be used as urine biomarkers to infer potential human OP exposure. Malathion mono- and diacid are specific urine biomarkers also found in produce. The occurrence of DAPs in fruits and vegetables (preformed biomarkers) may confound the interpretation of urine biomonitoring data. Source and time-metabolite concentration relationships in strawberry foliage and berries were studied in 2007 at 3 times during three weeks after malathion application at a commercial strawberry farm in Santa Maria, CA. Malathion and derivatives including malaoxon, Dimethyl phosphates (DMPs) and malathion acids were measured. Malathion derivatives (total nanomoles) were higher in foliage than in berries at each interval. During a 7-week post-application period in 2008, DMPs were present in leaves and berries long after malathion was not detectable. Preformed biomarkers persist much longer than the parent insecticide in strawberries.

AGRO 96
Toxicity of pyriproxyfen, a juvenile hormone mimic, against Asian citrus psyllid, *Diaphorina citri*
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The Asian citrus psyllid (ACP), *Diaphorina citri*, is a pest of Citrus crops worldwide. The economic importance of this pest is mainly due to its ability to transmit three phloem-limited bacterial species in the genus *Candidatus* Liberibacter. These bacteria are presumably responsible for the destructive citrus disease, huanglongbing (HLB) also known as citrus greening. HLB is considered the greatest disease threat to citrus production in the world for which there is no cure. Diseased trees die within 5-10 yr and produce unmarketable bitter-tasting fruit. Pyriproxyfen, a non-terpenoidal juvenile hormone mimic, has been shown to be toxic to many insect pests across several insect orders including Hemiptera. In this laboratory investigation, we have shown that pyriproxyfen inhibited egg hatch, reduced nymph survival and adult formation as well as negatively affected the reproduction of adult ACP in age-, stage-, and concentration-dependent manners. Effects of pyriproxyfen were more pronounced in younger age eggs and early instar nymphs compared with older age eggs and late instar nymphs. Nymphs treated as early instars resulted in lower adult emergence compared with nymphs treated as late instars. Topical treatment of newly emerged adults with pyriproxyfen resulted in lower fecundity and fertility compared with controls. The potential usefulness of pyriproxyfen as an important component of integrated pest management programs for ACP is discussed.

AGRO 97
Vibration spectroscopy of polyoxometalates and intermediates, applied as agents against plant viruses
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Plant viruses, such as Tobacco mosaic virus (TMV) and Cucumo mosaic virus (CMV), even nowadays are a threat to numerous plant cultures. Polyoxometalates (POMs) are named as compounds with remarkable bioactivity, and some of them, besides for animal/human viruses, have antiviral activity against plant viruses. As an example, we confirmed the antiviral activity of tungstophosphoric acid and its compounds for antiviral activity on tobacco plants, after foliar application on Nicotiana tabacum, var. Samsum infected with TMV or CMV, as host plant. In the present study, ammonium-decavanadate was investigated as a new candidate for antiviral activity. In addition, a Thermo scientific DXR Raman Microscope was used as a powerful tool for imaging of tobacco leaves, previously treated with several dosages of POMs (tungstophosphoric acid and ammonium-decavanadate). To follow the chemical forms of the applied compounds in plant physiological conditions, the fresh juice of tobacco plants was used in those experiments as well. Results were completed by FT-IR spectroscopy, as a complementary vibration technique. Obtained results were compared with data of NMR spectroscopy investigation, and the monovacant lacunary Keggin anion was found to be the bioactive form in the plant's juice.

AGRO 98
NIST's roles in providing measurements and standards in chemistry through collaborations with government, industry, and academia
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The National Institute of Standards and Technology (NIST) is a non-regulatory agency in the Department of Commerce with a mission “to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.” The Chemical Science and Technology Laboratory (CSTL) is one of ten discipline-based technical units within NIST and serves as the Nation's primary reference laboratory for chemical measurements, standards, and data, to promote commerce, improve quality of life, and innovation in the areas broadly encompassed by chemistry, the biosciences, and chemical engineering. The research and measurement services provided by CSTL are critical to all chemistry-related industrial sectors and technology areas and to other government agencies, standards and trade organizations, and academia. This presentation will provide examples of how NIST interacts and collaborates with government, industry, and academia to provide the measurement tools they need to fulfill their missions.

AGRO 99
EPA's lead, renovation, repair, and painting program: Final rule
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In the US, the major exposure pathway to lead (Pb) for children is from deteriorated Pb-based paint (LBP), Pb-contaminated house dust and residential soil. Approximately 40% of U.S. housing have some Pb-based paint. Housing built prior to 1978 is the most likely to contain LBP. Each year, over 10 million renovations occur in homes, child-care facilities and schools potentially containing LBP. In the April 22, 2008 Federal Register, the U.S. Environmental Protection Agency (EPA) published “Lead; Renovation, Repair, and Painting Program; Final Rule” (RRP). The Rule is intended to reduce exposure to Pb hazards created by renovation, repair, and painting activities which disturb LBP. Rapid, on-site, inexpensive identification of Pb-based paint using test kits is required by the Rule. Research to date has shown that commercially-available Pb paint test kits suitable for use by remodelers, renovators and painters are not effective in identifying the regulated levels of Pb in paint > 1.0 mg/cm^2 or 0.5% by weight. The EPA's Office of Pollution Prevention and Toxics (OPPT), the Office of Research and Development (ORD), and the Office of the General Council are working together to stimulate the development of commercially available Pb test kits that would meet the Rule's requirements. This presentation provides an insight on how EPA offices work together with manufacturers of test kits to meet the RRP's requirements. It is expected that once the RRP rule is in effect, the use of the improved Pb paint test kits would result in net benefits for children estimated at between $300 million and $1,300 million per year. Additionally, approximately 1.4 million children under the age of 6 and 5.4 million adults will have their exposure to Pb-containing paint dust reduced. These reductions support the Federal goal of eliminating childhood Pb poisoning by the year 2010.

AGRO 100
Advancing partnerships to combat climate change
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The Environmental Protection Agency's Energy Supply and Industry Branch (ESIB) comprises three voluntary programs that work collaboratively to combat climate change. They engage a diversity of stakeholders which include businesses, universities, other government agencies, non-governmental organizations, and professionals. Partnering with these stakeholders, ESIB's programs provide technical assistance and serve as forums for sharing information on greenhouse gas (GHG) measurement and accounting, innovative efficient and renewable energy technologies, and market-oriented practices to reduce carbon footprints. Specific examples include: a collaboration with the World Resources Institute to develop new guidance for reporting GHG emissions from business supply chains; a cooperative arrangement with the Association of State Energy Technology Transfer Institutions to investigate opportunities for combined heat and power applications for wastewater treatment facilities, and a partnership with the National Renewable Energy Laboratory to assess the voluntary green power market.

AGRO 101
Environmental technology verification: Benefits of collaboration
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The U.S. Environmental Protection Agency's Advanced Monitoring Systems (AMS) Center began in October 1997. The AMS Center was established to verify the performance of commercially available technologies for monitoring, sampling, and characterizing contaminants and natural species in a variety of matrices including air, water, and soil. The AMS Center develops test plans, conducts independent tests of technologies, and prepares verification reports and statements for the tested technologies. Vendors of these technologies can use these reports and statements for marketing purposes. Regulators, permitters, and users of the verified technologies can refer to the verification reports and statements to help guide decision making. To date, the AMS Center has completed verification tests of over 125 technologies, including emission monitors for mercury, dioxin, and ammonia; ambient monitors for fine particulate, ammonia, hydrogen sulfide and ozone; test kits for arsenic, cyanide, atrazine, and other water contaminants. Nearly 20 additional technologies are currently in the verification testing process.

AGRO 102
An industry perspective on collaborative projects on pesticides involving government, academic, and industry scientists
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Synthetic pesticides arguably have the most comprehensive datasets on the potential human and environmental impact of any class of anthropogenic substances. Prior to introduction and throughout their lifecycle they are subject to intense regulatory scrutiny, are the focus of continuing research and development and undergo frequent regulatory reevaluation. The range of scientific disciplines involved in these processes offers considerable opportunity as well as the necessity for cooperation between academic, governmental and industry scientists. Dependent on the issue, the form of this cooperation can range from cooperative research and development agreements, work groups convened under independent institutes, workshops sponsored by scientific societies or independent projects with external advisors. While the objective of all such cooperative projects is to ensure robust, scientific methods or assessments the primary focus and timeframes of different stakeholders can vary. Points that should be considered to ensure successful projects will be discussed.

AGRO 103

Hierarchical approach for obtaining values of physical and chemical parameters controlling the transport and fate of pesticides and their transformation products in the hydrologic system

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Results from mathematical simulations of contaminant transport and fate in the hydrologic system have been published for over three decades, but numerical values for many of the physical and chemical parameters that such models require are rare or absent for many anthropogenic compounds of interest, especially transformation products. A hierarchical approach is therefore proposed to obtain values for water solubility, Henry's law constant, and several other key parameters of interest, using pesticides and their transformation products as illustrative examples. Critically reviewed, measured parameter values from the literature receive highest priority. Quantitative property-property relations are used when values are available for some parameters but not others. If needed, quantitative structure-property relations are used to calculate parameter values de novo, or to estimate them by adjusting literature values for structurally similar compounds. The approach also specifies standard conditions for the parameters of interest and, where necessary, adjusts parameter values to these conditions.

AGRO 104

FOOTPRINT Pesticide Properties Database: Why and how it was developed and its future role in environmental risk assessments

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The demand for pesticide data has grown considerably over recent decades, due to more stringent regulatory controls and the use of data-hungry modelling, risk assessment and decision support systems. Identifying relevant, fit-for-purpose data is a problem well known to researchers, industry and regulators world-wide who struggle to use data of sufficient quality to allow them to undertake robust assessments with confidence. The resulting problems are extensive and the further development of risk assessment methodologies may become hampered by the quality of the data available. As risk assessments are used to develop environmental policy, formulate mitigation and remediation plans and develop best practice advice it is essential that quality data is available. Three years ago my research group launched our own solution to the problem - the FOOTPRINT PPDB. This presentation will explain the thinking and management behind the PPDB and outline my future plans and aspirations. It will also discuss industry Intellectual Property and the needs for data harmonisation.

AGRO 105

What drives pesticide runoff: An empirical journey to a framework for pesticide runoff using some of Don's ideas

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This work pursued some of Don Wauchope's ideas: a “better index of runoff potential”, that partition coefficients (KP) increase with time of soil contact and “runoff available residues” dissipate more rapidly than for bulk soil. I used published data and my own rainfall simulator plots. The ratio of event runoff to soil (0-25 mm) concentrations for bare soil was remarkably consistent for 3 sites and 14 pesticides with different properties, over 4 orders of magnitude. As a first approximation, runoff concentration (µg/L) = 28 times soil concentration (mg/kg). Published data for pesticides in US croplands indicated similar results, though results varied with erosion intensity. An explanation for this consistency is offered. Half-lives were shorter in surface soil than deeper soil. KP values in runoff increased with time of contact and were greater than published values. Moderately sorbed pesticides (e.g. endosulfan) were less sorbed than expected in the first few days after spraying.

AGRO 106

Simulation models, macropores, tillage, and rainfall intensity role in pesticide transport through soil

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Pesticide transport through soil is a difficult subject under the simplest of conditions. Therefore, studies often do not include additional complexity such as variable tillage, rainfall intensity, and macropore characteristics. Pesticide transport models can be used to gauge how well we understand a system or process - if we can't model it, we don't understand it. If we can model the complexities of pesticide transport through soil, we can then more rigorously defend extrapolating field and laboratory experiments to conditions not included in the original experiment. Through our laboratory, field, and modeling studies, it is clear that macropores, rainfall intensity, and tillage are important to pesticide transport through soil. For example, pesticides with very different sorption characteristics leached to 2.4 m within a few hours of rainfall initiation. Also, most rainfall simulation experiments use constant intensity but natural rainfall is variable, which can greatly increase pesticide transport through soil macropores. Tillage is another factor that drastically affects flow of water and chemicals through soil, but how macropore characteristics change over time after tillage and several rainfalls are poorly understood reducing our confidence in modeling this phenomenon. Further research on these topics will help us more thoroughly understand how pesticides move through soil and more confidently predict their environmental fate under different conditions.

AGRO 107

Field run-off and buffer performance testing: An historic tour of studies, breakthroughs, and technical contributors

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The measurement of agricultural runoff, including crop protection chemicals, is an important part of the overall risk assessment process used to insure drinking water and the environment are suitably protected in a regulated industry. Measuring chemical runoff under natural rainfall conditions remains an elusive goal as it is critical to have runoff-producing rainfall shortly after an application is made. The

high risk of weather-related study failure led the industry toward runoff testing using simulated rainfall on a range of scales. Many scientists contributed over the past 20 years to the advancement of techniques used to quantify chemical runoff using simulated rainfall, and more recently to use this methodology to study the performance of buffer strips in reducing erosion and chemical loading to receiving waters. A review of the past experiences and proposals for future development in the area of runoff testing will be presented as a tribute to Dr. Don Wauchope's significant contributions in this field.

AGRO 108
A new PRZM algorithm for predicting biphasic degradation of pesticide in soil using coupled time-dependent sorption and degradation kinetics: Model theory and conceptualization
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Many studies have shown that adsorption of pesticide by soil is time-dependent and that desorption from the sorbed phase limits the rate of bio-degradation. In this paper, we present a set of physically-based mathematical approaches to describe the coupled, time-dependent sorption and degradation kinetics as well as their implementation into the Pesticide Root Zone Model (PRZM). The newly developed PRZM version (PRZM4) is compared to other regulatory models that have similar environmental fate routines. Physical implications of and relations between different mathematical approaches are also discussed. Analysis with laboratory and field experimental data is provided to elucidate the rate-limiting effect of time-dependent sorption on degradation and transport in soil. This is the first part of a two-paper series. In the second paper, PRZM4 is evaluated against a wide range of field-observed data obtained from different geographical locations under different environmental conditions.

AGRO 109
Incorporating effect of vegetative filter strip in pesticide aquatic exposure assessment
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Vegetative filter strips (VFS) are mitigation practices that have proven to be effective in reducing runoff, sediment and pesticide loading from agricultural fields to adjacent non-target areas and water bodies. Studies have shown that VFS effectiveness in reducing pesticide loading is directly related to reduction in runoff and sediment loading. Recently, an empirical pesticide trapping equation has been linked with a numerical simulation model (VFSmod) capable of predicting both runoff reduction (i.e., infiltration) and sediment trapping. The integrated model, called VFSmod-wq, is capable of predicting hydrology, sediment transport and pesticide trapping through VFS in numerous hydrologic settings. In this research, VFSmod-wq was interfaced with the models PRZM and EXAMS. The modeling system was used to simulate pesticide loading from a corn field in Illinois and an orchard field in Michigan to an adjacent pond, and to estimate the effect of VFS on water exposure concentrations. This presentation will provide a background on VFSmod-wq, describe the PRZM/VFSmod-wq/EXAMS modeling system, and discuss the results from the application of the modeling system to the Illinois corn and Michigan orchard scenarios.

AGRO 110
Modeling pesticide total residues of toxicological concern
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The Office of Pesticide Programs (OPP) of the U.S. EPA is required to estimate exposure concentrations for parent pesticides and their degradation products. The modeling approach for estimating pesticide concentrations is dependent on the type of environmental fate data available for the pesticide and its degradation products. A complete environmental fate database is required for estimating the decline rate of the parent compound as well as formation and decline rates of degradation products. In the absence of a complete environmental fate database, total toxic residue exposure modeling approaches can be used to estimate the concentration of combined residues. Three modeling approaches have been applied for estimating pesticide and degradation product concentrations in aquatic environments. These methods include: (1) the formation/decline kinetics method, (2) the residue summation method, and (3) the total residue method. This paper will describe these methods, their strengths and weaknesses, and their application in exposure modeling.

AGRO 111
Comparison of aquatic exposure assessment models for pesticide use on rice
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An evaluation of six modeling approaches for estimating environmental concentrations associated with the use of crop protection chemicals on rice was conducted. A comparison of estimated environmental concentrations computed with all six approaches (EPA Tier 1, MED-RICE, Japanese regulatory spreadsheet “Ecotox2”, PCPF-1, EXAMS-Rice, and RICEWQ) is presented along with the status of their regulatory acceptance for pesticide registration in the United States, European Union, and Japan. Of the six models, RICEWQ is better suited for higher tier risk assessment based on its ability to conduct probabilistic assessments and to simulate multiple pesticide applications, metabolites, and the flooding, overflow, and controlled releases of water associated with rice production. An important factor in model acceptance is the ability to reproduce observed data. Case studies validating the performance of RICEWQ are presented to support the acceptance of the model by the U.S. Environmental Protection Agency and other regulatory agencies.

AGRO 112
Cumulative tracking of pesticide drift in New Zealand
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A system (cumulative agrichemical residue tracking, CART) has been developed for tracking the off-target deposition of sprays applied to crops in New Zealand within a web-based Geographical Information Systems (GIS) environment. The effect of the sprayer setup and meteorological conditions define the initial spray release. Transport is assessed using the AGDISP code and modified through new algorithms on shelterbelt spray interception because most fields in NZ are surrounded by such vegetation. Deposition to aquatic or terrestrial areas is predicted based on model calculations. Examples are given of performance for model predictions relative to field study data using biomarker/ cation tracers. The fit of CART to field data requires improvement so this research is being extended through the development of new models for spray drift from ground-based application systems for row, tree and vine crops.

AGRO 113
Development and application of a minimal calibration approach for watershed-scale modeling of pesticides with SWAT
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Past applications of the Soil and Water Assessment Tool (SWAT) to simulate pesticide fate and transport nearly always include calibration to site specific data to achieve acceptable model performance. This site specific calibration is impractical if SWAT is to be used to efficiently evaluate large numbers of watersheds over varied geographical regions. This study focused on the development and application of a minimal calibration approach to the SWAT model for pesticide simulations in small watersheds of less than 100 square miles. First, an un-calibrated parameterization methodology was applied to simulate pesticide fate and transport in 20 watersheds across the Midwest corn belt. The un-calibrated model performance was evaluated based upon both measured pesticide concentration time series and frequency distributions for each watershed. Next, a minimally calibrated parameterization from a single representative watershed in each region was developed and extended to all watersheds in the region. The approach has potential to enable the use of SWAT for national level assessments of pesticides in small watersheds.

AGRO 114
Lessons learned from an exercise to evaluate watershed-scale pesticide fate and transport models
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The U.S. Environmental Protection Agency, Office of Pesticide Programs has completed an evaluation of three watershed-scale simulation models for potential use in pesticide drinking water or aquatic ecological exposure assessments. Models selected for evaluation were the Soil Water Assessment Tool (SWAT), the Nonpoint Source Model (NPSM), a modified version of the Hydrologic Simulation Program-Fortran (HSPF), and the Pesticide Root Zone Model-Riverine Water Quality (PRZM-RIVWQ) model. The effort was challenging at several points. Investigations revealed that the poor performance in many of the statistics which were chosen to measure agreement between measured and modeled concentrations could plausibly attributed to uncertainties in factors such as the exact timing of pesticide applications in various parts of the watershed, uncertainties in extrapolation of pesticide concentrations to non-sampling days, and to variability of soil, geographic features and weather.

AGRO 115
PRZM version 4.2 calibration, geospatial extrapolation, and model output query tool
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Observed soil data from several field studies are compared to predicted results from the soil sorption kinetics version of the Pesticide Root Zone Model (PRZMV4.2). The new PRZM algorithm predicts soil residues better and deals more accurately with bi-phasic degradation compounds in leaching assessment. For each calibration, an automated algorithm was created to run PRZMV4.2 over a matrix of 21,000 varying combinations of K_{OC}, dissolved half-life in soil, rate of desorption, and fraction of pesticide residues available for instantaneous sorption from user-specified ranges. Calibration results were used to identify the best-fit environmental fate parameters which were then used in large geographical scale simulations with local soil and weather inputs identified with GIS databases. Predicted results were assembled into a database and integrated with a GIS-enabled decision-making query tool. This tool allows users to extract tables and generate maps of model predictions meeting user-defined combinations of geography, soils, and crop management conditions.

AGRO 116
Is the U.S. Environmental Protection Agency's pesticide aquatic risk assessment process protective?
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The U.S. Environmental Protection Agency uses a tiered system to conduct risk assessments as part of the pesticide registration process under FIFRA. Many aquatic risk assessments, including those for endangered species, do not progress beyond the Tier 2 level that utilizes the Pesticide Root Zone Model (PRZM) and Exposure Analysis Modeling System (EXAMS). This presentation contains a critical review of the models, scenarios, and input parameter values used to estimate environmental concentrations at each tier. Case studies are presented that benchmark model predictions to monitoring data. The significance, sensitivity, and relative importance of assumptions imbedded in the methodology are discussed with respect to over- or under-predicting exposure in ecological and drinking water risk assessments.

AGRO 117
Solvents as practical tools in laboratory aquatic toxicity testing
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Solvents are used in aquatic toxicity tests with difficult to test substances (typically low water solubility). Solvent controls are used to assess potential effects of solvent on the test outcome. The amount of solvent used is very small, e.g. ≤0.01% by volume and orders of magnitude below concentrations known to cause toxicological effects in the test system. Solvents are only used when necessary to aid dissolution of test material. Non-solvent, alternatives to prepare test solutions include generator columns; however, in some cases these columns can be less effective and less consistent in preparing stable test solutions. In our experience, alternative methods are, time-consuming and require additional analytical support compared to solvent preparation. Therefore, in practice are less functional in a high-throughput testing environment such as a contract research organization. Practical use of solvents and the lack of significant impact of their use on study results will be reviewed.

AGRO 118
Dimethyl formamide (DMF) as a vehicle for delivery of test substances in aquatic toxicology testing
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Dimethyl formamide (DMF) has been used in aquatic ecotoxicity tests for many years to assist in the dissolution of low-solubility test substances. Despite this long history, concerns with the use of DMF have recently been raised. Historical data suggest that DMF does not cause observable toxic effects at the concentrations specified in US EPA and OECD test guidelines (< 0.5 mL/L in static renewal tests, and < 0.1mL/L in flow-through tests). We present data from large numbers of both acute and chronic aquatic toxicity tests that allow assessment of the consequences of use of DMF, and discuss the trade-offs involved in the delivery of poorly soluble test substances to aquatic test systems with and without the use of DMF.

AGRO 119
USEPA's Office of Pesticide Programs guidance for evaluating aquatic toxicology studies using dilution water and solvent controls
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Co-solvents are utilized in aquatic toxicity studies to facilitate the introduction of test material into the dilution water. Use of co-solvents in aquatic toxicity studies is generally discouraged, but may be necessary for test chemicals with low solubilities. Issues regarding testing with both dilution water (negative) and solvent controls have been the subject of extensive discussion among scientists both nationally and internationally. OPP has developed guidance for the analysis and interpretation of aquatic toxicology studies in which both a negative and a solvent control are utilized. Specifically, the guidance relates to the handling of the negative and the solvent controls for statistical analysis of the data to determine study endpoints (e.g., NOAEC, ICx, LCx, and ECx) for the response measures. At issue is the potential classification of studies where response measures are statistically different between the solvent and negative controls. This paper presents that guidance and the associated issues.

AGRO 120
Statistical issues in the use of solvents in aquatic toxicology experiments
John W Green, *John.W.Green@usa.dupont.com, Applied Statistics, DuPont, 1090 Elkton Road, S320/524A-4, Newark, DE 19711, Fax: 302-366-5211*

Solvents are often used in aquatic toxicology experiments for regulatory product submissions for pesticides and herbicides. The reasons for, and implications of, and the controversies surrounding, this practice will be discussed, in part using an investigation of over 100 biological endpoints from more than 50 acute and chronic experiments from five chemical companies. Alternative methods of statistical analysis and the statistical conclusions that can be reached regarding NOECs and EC50 and EC25 estimates will be described. The possible interaction of test substances and solvents on conclusions will be explored. Particular focus will be on how the concurrent dilution water and solvent controls are utilized in statistical analysis and acceptance criteria and how this use impacts the power of statistical methods to detect adverse effects. Attention will also be given to recent regulatory guidance.

AGRO 121
Revisiting statistical hypothesis testing
Michael C Newman, *newman@vims.edu, School of Marine Science, Virginia Institute for Marine Science, Glouster Point, VA 23062-1346*

Conventional ecotoxicity methods rely heavily on conventional “reject-nil-hypothesis-accept-effect-hypothesis” inference that is neither statistically sound nor consistently reliable for decision making. Whether deciding how to include aqueous and solvent blanks, or determine no-observed-effect-concentrations and lowest-observed-effect-concentrations, current shortcomings impede statistically testing for deviation from null hypotheses. More attention to and a priori selection of alpha, beta, and effect size permits correct inferences by allowing estimation of positive predictive value (PPV) of positive tests.

AGRO 122
Discussion and final thoughts from the solvents in aquatic toxicology testing symposium
Spencer R. Mortensen, *spencer.r.mortensen@monsanto.com, Regulatory Product Safety Center, Monsanto Company, 800 N. Lindbergh Blvd., St. Louis, MO 63167, and John W Green, John.W.Green@usa.dupont.com, Applied Statistics, DuPont, 1090 Elkton Road, S320/524A-4, Newark, DE 19711*

Abstract not available

AGRO 123
Overview of EPA's Sector Strategies Program and its work with the chemical industry.
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The Sector Strategies Program promotes improved environmental protection, energy efficiency, and resource management in high-impact industries and fuel production sectors, including the chemical industry. The program performs in-depth analysis of sector impacts, trends, policy issues, and strategic options (see the 2008 Sector Performance Report and all published analyses at www.epa.gov/sectors). The program engages stakeholders (government, industry, NGOs) in policy dialogue and strategic planning. Using the insights gained from these analyses and perspectives, the program then designs and implements focused strategies (policy decisions and program actions) that reduce barriers to progress and drive sector-wide performance improvement. The conference presentation will provide an overview of the program approach and activities, with a particular focus on work involving the chemical industry.

AGRO 124
Media training for scientists
***Richard Hayes**, rhayes@ucsusa.org, Deputy Director - Communications, Union of Concerned Scientists, Washington, DC, DC 20006-1232*

This interactive presentation is based on my book “A Scientists Guide to Talking with the Media.” Participants will learn how to craft and deliver effective messages that are scientifically accurate and accessible to the public. We will view several clips of scientists on national news programs that will lead to a group discussion on best interview practices. Attendees will learn advanced techniques that will increase their confidence and help them keep their cool during difficult interviews. Scientists will also have the opportunity to share their own experiences with reporters for feedback. The talk is appropriate for scientists with limited media experience as well those wishing to hone their skills.

AGRO 125
The success of green chemistry collaborations
***Richard E. Engler**, engler.richard@epa.gov, Green Chemistry Program, US Environmental Protection Agency, Washington, DC 20460*

EPA's Green Chemistry Program as been promoting green chemistry throughout the chemical enterprise since the early 1990s. The Program's success is largely due to collaborations with academia, industry, government agencies, and non-governmental organizations. Together, green chemistry partners are discovering, developing, and deploying cost-effective technologies that help us achieve a more sustainable society.

AGRO 126
The Global Innovation Imperatives
***Francisco Gomez**, F_gomez@acs.org, ACS, Las Vegas, NV 89119*

The Global Innovation Imperatives (Gii) is a collaborative venture between the American Chemical Society's Committee on Corporation Associates (ACSCCA) and the Society of Chemical Industry (SCI). The Gii Mission is to create community and knowledge transfer to stimulate global scientific innovation that meets societal imperatives. The focus of Gii's activity is on specific Global Innovation Imperatives. The ACSCCA and SCI are particularly interested in collaborating in areas where they can stimulate industrial innovation to tackle societal needs. The first imperative chosen for the Gii program is water. We have a strong and growing community that includes both, academia and industry. This talk will consider the advantages of international collaborative projects and, in particular, it will focus on the success story of Gii as a model to follow. The potential role of individuals, institutions, private companies, non-profit organizations, government entities and other stakeholders will also be discussed.

AGRO 127
Review of pesticide ground water issues and research
***Russell L. Jones**, russell.jones@bayercropscience.com, Bayer CropScience, Stilwell, KS 66085*

The potential for active ingredients in plant protection products and their metabolites to move to ground water became a regulatory concern when pesticides were discovered in potable wells in the late 1970s. This triggered basic research into movement of pesticides in the soil and ground water as well as practical measures for minimizing movement to ground water and preventing residues in potable wells. During the 1980s designs for research studies and models of transport and degradation processes were developed and these were used to define both product specific and generic management practices. The development of GIS techniques has allowed more precise assessments and targeting of management practices. More recently models have been enhanced by more advanced process descriptions, such as non-equilibrium sorption and associated deviations from single first order kinetics.

AGRO 128
Current and future role of adsorption studies in pesticide leaching assessment for nonstructured soils
***Jos Boesten**, jos.boesten@wur.nl and Wim Beltman, wim.beltman@wur.nl, Centre for Water and Climate, Alterra WUR, Wageningen 6700 AA, Netherlands*

CDE-type models play an important role in the EU assessment of pesticide leaching to groundwater. These models are very sensitive to sorption parameters. The quality of measured batch sorption parameters is debatable for relatively weakly sorbing pesticides. This combination of large sensitivity and debatable quality is undesirable. A recent analysis showed that this sensitivity disappears almost completely for multi-year leaching scenarios if the degradation rate is assumed to be proportional to the concentration in the liquid phase (instead of proportional to the concentration in total soil). This disappearance is caused by two counteracting effects: higher sorption leads to a slower overall degradation rate but also to a longer residence time in soil. Probably the leaching models will switch to this new degradation rate concept in future. Then the sorption parameters will become less important as model input parameter but they remain important for accurate measurement of this new degradation rate.

AGRO 129
Modelers getting real: Linking conceptual models, algorithms, and monitoring data
***Paul Hendley**, paul.hendley@syngenta.com, Product Safety, Syngenta Crop Protection Inc, Greensboro, NC 27410*

For many years, model developers have been criticized or complimented, depending upon the audience, for the complexity of the algorithms included in new models. Validation and calibration of models when there are large numbers of variables in the model has been the subject of considerable debate. However, in more sparsely parameterized models, comparisons between field

monitoring data and model output allow important conclusions to be drawn that inform the user about model design. In some cases, discrepancies between model predictions and monitoring data indicate that certain hydrologic processes have been ignored in the model. This can be significant when trying to use a model to extrapolate monitoring data to broader scales since the hydrologic processes "missing" from the model may vary in significance by region.

AGRO 130
Improving model performance through model parameterization
***Qingli Ma**, qinglima@ets-md.com and Stuart Cohen, ets@ets-md.com, Environmental & Turf Services, Inc Wheaton, MD 20902*

Simulation models have been used widely by researchers and regulatory agencies. Researchers use models to explore relationships that cannot be easily examined through experiments. Their interests remain the improvement of model prediction accuracy. Regulatory agencies use models in support of decision-making, such as in chemical registration and re-registration. Their interests are always in the predicted levels (concentrations) of chemicals in the media (e.g., in surface water). Model performance can be improved significantly if it is parameterized correctly with full understanding of the underlying assumptions and the physical processes they represent. Model parameterization is a science as well as an art. User influence on model parameterization and model performance has been demonstrated to be significant. We present a number of studies of model parameterization strategies that lead to better model predictions of pesticide fate and transport. The current and future development of model parameterization to reduce user subjectivity is also discussed.

AGRO 131
Modeling heterogeneous environmental systems: Evolving data needs
***Elizabeth Behl**, Behl.Betsy@epamail.epa.gov, U.S. EPA, Office of Pesticide Programs, Washington, DC 20460*

EPA develops environmental risk assessments for pesticides with a level of complexity matched to needs. Initially, EPA evaluates risk in a vulnerable pond environment. If estimated levels are not acceptable, assessments are refined for a diversity of environmental conditions (e.g. climate, soils), agronomic conditions (pesticide application methods/tillage practices), and management practices (spray drift buffers). Increasingly risk assessment frameworks are being extended to address broader, complex questions of exposure in heterogeneous aquatic environments (vernal pools, ground water, estuarine/marine environments) and in air. In the future, pesticide environmental chemistry data must also evolve to meet these demands.

AGRO 132
Modeling pesticide risks: Start with groundwater, go to turf, and keep going
***Stuart Z. Cohen**, ets@ets-md.com, Environmental & Turf Services, Inc, Wheaton, MD 20902*

A famous rock band once said, "What a long, strange trip it's been". Don has been part of both, the 'long' and the 'strange'. He first entered my life in 1983 as an anonymous reviewer of my first comprehensive paper on pesticides in ground water – hence, "long". Regarding "strange": our differences in explaining the surprising mobilities of the triazines; fish head soup in Bangkok; piano playing in Germany; log rolling in West Virginia; and turf investigations early in our careers. Pesticides in ground water was a hot topic for approximately two decades beginning in 1979. The issue of pesticide fate and risks in urban environments has had much focus in this decade. Just as the ground water contamination issue has required new applications of interdisciplinary talents within the pesticide science and hydrogeology fields, urban pesticide risk assessment and risk management require applications of an even broader range of disciplines. This new challenge requires people with the creative thinking abilities of a Don Wauchope.

AGRO 133
The Melbourne 2010 IUPAC Congress on Pesticide Chemistry: An introduction
***Greg Simpson**, greg.simpson@csiro.au, Molecular & Health Technologies, CSIRO Australia, Clayton 3158, Australia*

The 12th IUPAC International Congress of Pesticide Chemistry will be held from 4-8 July 2010 in Melbourne Australia. The theme of the conference is Chemistry for a Sustainable World. The conference will address the following key areas: Emerging Issues for Industry; Pest Management and Crop Protection; Formulation and Delivery; Regulatory and Residue; Environmental Fate and Safety Assessment. A number of outstanding industry leaders have agreed to be plenary speakers for the conference including: Professor Barry Hart Monash University; Dr Ganesh Kishore (Burrill and Company);Professor Ian Baldwin (Max Planck Institute); Professor Sir Colin Berry (Royal London Hospital); and Professor Peter Baur (Bayer CropScience AG). The organisers of the conference are presenting a wide range of symposia, posters and discussion meetings which will allow delegates to understand the key issues facing the crop protection and pesticide communities, and also to visit some of Australia's scientific, cultural and tourist highlights.

AGRO 134
Australia and the emerging bioeconomy
***Cameron J. F. Begley**[1], Cameron.Begley@csiro.au, Dr Deborah O'Connell[2], Dr Mikael Hirsch[3], Dr Peter East[1], and Dr David Robson[4]. (1) Division of Entomology, CSIRO, Canberra, Australia, (2) Division of Sustainable Ecosystems, CSIRO, Gunghalin, Australia, (3) CSIRO, Campbell 2600, Australia, (4) Faculty of Science & Natural Resources, University of Cumbria, Newton Rigg Campus, Penrith, UK*

This paper outlines possible responses for Australia to the national challenges emerging in the use of biological resources to provide food, energy and materials; broadly speaking "the Bioeconomy". If Australia responds in an integrated fashion, it is feasible that Australia would accelerate the creation of secure food, sustainable industrial products and low emission energy production through the development of low greenhouse gas (GHG) sustainable processes and reinvigoration of agribusiness, rural industries and manufacturing sectors. Australia needs to explore different approaches to issues of national significance relating to: the growth and competitiveness of new and existing industries; health, longevity and productivity of its people; and sustainability of its environment and natural resources. And the new challenges that Australia (and other Western economies) face are: rising concerns around food security with tightening freshwater availability; emerging global trade patterns and land use sustainability; tightening supplies of crude oil (that feeds its transport fuel and industrial chemistry needs) and its impacts on prices for basic goods; rising concerns around the impact of GHG emissions and the need to find lower carbon solutions to current consumption patterns; imperatives to reduce the environmental footprint of current production and manufacturing systems; a desire to renew the rural economies of western countries and identify sustainable and profitable practices for constituents; the rise of low cost manufacturing capabilities in East Asia and the sub-continent and a need to find differentiated value added manufactured goods.

AGRO 135
Pest population dynamics: Changing climate, agricultural landscapes, and pesticide usage in Australia
***Myron P. Zalucki**, M.Zalucki@uq.edu.au, School of Biological Sciences, The University of Queensland, St Lucia, Brisbane 4072, Australia*

Clearing and cultivation of land for agriculture throughout Australia has culminated in today's highly modified landscapes and a perceived loss of ecosystem services for pest control. Management of pests has come to rely increasingly on the use of pesticides, despite the IPM mantra. Over the last thirty years pesticide input costs per hectare have increased faster than the price index, reflecting more costly products, changes to the combinations of crops grown and an increase in the overall area of crops cultivated and possible concomitant changes in pest abundance. Any pest crisis usually ensures rapid changes in practice. In most cases we cannot objectively test if changed practices are responsible for changes in pest abundance or if the latter is simply due to the weather and/or landscape features (e.g. area of host plants). Reversing these changes to better utilise ecosystems services is technically and socially challenging particularly in a changing climate.

AGRO 136
Breeding improved crop cultivars for water-scarce environments
*Richard A Richards, richard.richards@csiro.au, Plant Industry, CSIRO, Canberra 2601, Australia, and **Ronald J Hill**, ron.hill@csiro.au, CSIRO, Molecular and Health Technologies, North Ryde NSW 1670, Australia*

Drought drastically reduces crop yields in Australia every year. Little irrigation water is available and almost the entire cropping region of Australia relies on natural rainfall. Globally, lack of water for use in agriculture threatens our ability to maintain food production. Unfortunately, progress in breeding higher yielding crops in water-scarce environments is slow due to unpredictable year-to-year variation in rainfall and within season variability. This unpredictable variation reduces heritability and slows genetic advance. This talk will discuss genetic and physiological factors that are responsible for variation in wheat growth and yield and how they can be used to improve the yield of cereals in water-scarce environments. Rapid progress is urgently required to meet the increased global demand for food in a world where water resources for agriculture are declining.

AGRO 137
MRL harmonization in the NAFTA region: A grower's perspective
***Daniel A. Botts**, Daniel.Botts@ffva.com, Florida Fruit and Vegetable Association, Maitland, FL 32794-8513*

As the movement of specialty crops across borders has increased globally, the importance of pesticide residue limit harmonization has moved to a greater level of prominence in the grower's ability to market their production. This has been especially true in the North American trading region as most domestic producers in the US consider Canada a common market subject to the same regulatory limits as for the US domestic market. With the passage of the Food Quality Protection Act in 1996 in the US and changes to the Federal legislation governing pesticides in Canada both countries have been or are currently involved in reviews of the dietary exposure and impacts of pesticide residues in food. Growers have taken a direct role in working with regulatory agencies, registrants and other stakeholders to define the needs and requirements necessary to accomplish near simultaneous authorization and common regulatory endpoints.

AGRO 138
Challenges for California specialty crops: MRLs as critical issues for export markets
***Lori A. Berger**, lori@specialtycrops.org, California Specialty Crops Council, Tulare, CA 93274*

The world-wide proliferation of disparate maximum residue levels (MRLs) for pesticides standards is an ongoing and growing concern for specialty crop exporters, especially in California. This trend poses significant barriers in Canada, Japan, Taiwan, Hong Kong and the European Union which are key U.S. markets. The lag time for global registrations of new crop protection pesticides often results in growers being unable to take advantage of newer pesticides which often are classified as “reduced risk.” Improved coordination of MRL related activities requires streamlined activities between grower groups, registrants, regulators and trade representatives so that markets for specialty crops may be protected and advanced. An inability to harmonize these efforts can be quite disruptive, if not devastating, to specific markets for specialty crops. This presentation will focus on some of the current challenges, concerns, and consequences posed as new regulatory requirements evolve through Codex and other regulatory bodies.

AGRO 139
Global MRL harmonization: Pipe-dream or reality?
***Philip A. Brindle**, philip.brindle@basf.com, Global Regulatory Affairs, BASF Corporation, Research Triangle Park, NC 27709*

Maximum Residue Levels (MRLs), established by many regulatory authorities as part of the process of registering crop protection products, are essentially trading standards which facilitate the export/import of food around the world. Since MRLs are established for specific active ingredient-crop combinations there are literally hundreds of thousands in existence and, not surprisingly, there is a great deal of MRL disharmony amongst different countries and regions. This disharmony is problematic for growers and exporters. It can lead to trade barriers whereby some treated crops cannot be exported to certain foreign markets, even though the crop protection products were used in accordance with country-specific labels. An overview of the reasons behind international MRL disharmony and the efforts in progress by crop protection companies, regulatory bodies, and other organizations, to harmonize MRLs globally will be presented.

AGRO 140
Challenges in horticultural trade for Kenya: An international perspective from a developing country
***Lucy M. Namu**, Lnamu@kephis.org, Kenya Plant Health Inspectorate Service, Oloolua Ridge, Nairobi, Kenya*

Agriculture plays a dominant role in Kenya's economy directly and indirectly, accounting for approximately 53% of Kenya's Gross Domestic Product (GDP) with around 80% of the population deriving its income from agricultural activities and accounting for around 60% of export earnings and over 45% of annual revenue. The horticultural sub-sector has grown to become the second most vibrant industry in the economy; for it to grow, it must be able to take advantage of and to overcome challenges posed by increasing globalization. Obstacles to the international registration of pesticides for minor uses and specialty crops are observed in many countries, as the development of pesticide uses for these purposes is not economically attractive to manufacturers. Kenya's main export commodities are specialty/minor crops with high economic value, however, the establishment of maximum residue limits (MRLs) for these crops remains scarce. The challenges faced by the horticultural industry are presented, and some initiatives with proposals on the way forward.

AGRO 141
Lessons from the EU MRL harmonization: How feasible is global MRL harmonization?
***Frédéric Rosseneu**, info@freshfel.org, Freshfel Europe, Brussels 1200, Belgium*

The 1st of September 2008 marked a milestone in the European fresh produce trade, as more than 15 years after the introduction of the single market, the myriad of MRLs applicable across the entire EU and their constant modification finally belong to the past. The positive EU experience should be an argument to evolve towards global MRL harmonization. Since trade issues with Russia late 2007, which revealed Russian MRLs for lower than EU MRLs, the relevance of global harmonization has even become clear to the EU. Besides technical and procedural challenges, two important aspects have to be considered: private requirements of retailers and the increased relevance of the ARfD in determining risks associated with pesticide residues. The presentation will focus on the lessons learned during the EU harmonization process (including the public acceptance), but will also look at other MRL-systems and the long-term feasibility of global MRL harmonization.

AGRO 142
Impact of maximum residue levels on international trade
***Gregg Storey**, gregg.storey@bayercropscience.com, Industry Relations - Food Chain Partnership, Bayer CropScience, Research Triangle Park, NC 27709*

A Maximum Residue Level (MRL) is the concentration of a chemical that is legally permitted or recognized as acceptable in, or on, a particular food, agricultural commodity or animal feedstuff. They are established by Codex or national regulatory authorities based on residue data obtained from Good Agricultural Practice (GAP) studies. The GAP studies are typically conducted by individual countries at several locations over 2 growing seasons to address climatic and regional variability. Because of the wide safety margins used in the MRL-setting process, MRLs are not toxicological thresholds. If exceeded, toxic effects are not expected to occur. International trade and concurrent inspections for adulterated food products have increased. As a result, establishment of MRLs has become critical to trade flow. MRLs will be defined relative to toxicity endpoints and the potential impact on global trade will be discussed.

AGRO 143
Harmonizing international pesticide residues: A consumer perspective
***Michael Hansen**, hansmi@consumer.org, Consumers Union, Yonkers, NY 10703*

There has been much debate on the need for uniform global standards for pesticide residue levels (so-called maximum residue levels, or MRLs) in foods. While there are some benefits for setting uniform globalized MRLs and while it is technically feasible to do so, formidable challenges still remain. For example, who will set the standards? How do you determine the objectivity of the standard setters? How do you ensure the independence of the standard setters? How do you deal with radically different diets among human populations? How do you get broad and democratic input into the process that produces MRLs? This talk will cover these and related issues, from the perspective of consumers.

AGRO 144
Developing the renewable fuel standard: Life cycle greenhouse gas emissions
***Robert Larson**, larson.robert@epa.gov, National Vehicle & Fuel Emission Laboratory, US Environmental Protection Agency, Ann Arbor, MI 48105*

This presentation will describe the efforts by the US Environmental Protection Agency (USEPA) to date for analyzing the greenhouse gas lifecycle emissions of biofuels anticipated to be produced and used in the United States over the next decade. USEPA performed these analyses in response to the Energy Independence and Security Act of 2007 which mandates use of up to 36 billion gallons of biofuel in the US by 2022. The presentation will describe the models used and highlight some of the key assumptions and challenges in predicting future greenhouse gas (GHG) emission impacts. The issue of uncertainty in assessment will also be addressed including the use of sensitivity analyses around some of the key variables affecting lifecycle assessment. In particular the importance of indirect land use changes on lifecycle GHG emissions will be considered.

AGRO 145
Economies and carbon burdens of renewable fuels
***Robert C. Brown**, rcbrown@iastate.edu, Center for Sustainable Environmental Technologies, Iowa State University, Ames, IA 50011, and Joshua Gifford, josh151@iastate.edu, Department of Mechanical Engineering, Iowa State University, Ames, IA*

Three particularly important metrics for alternative transportation fuels are financial economy, energy economy, and carbon economy. Financial economy is the cost of fuel per unit distance traveled ($/km); energy economy is the amount of primary energy consumed per unit distance traveled, including energy consumed in production and utilization of transportation fuel (MJ/kg); carbon economy is the amount of greenhouse gas emissions in carbon dioxide equivalency per unit distance traveled, including greenhouse gases emitted during both production and utilization of transportation fuel (g CO_2/km). The goal is to minimize all three of these metrics. The recently proposed Low-Carbon Fuel Standard (LCFS) is a version of the third metric although it is expressed as g CO_2/MJ of fuel consumed. A more effective greenhouse gas policy would assign “carbon burdens” to all products and services arising from economic activity, measured in terms of metric tons of CO_2 per $1000 dollar of economic value of a product or service. For example, corn ethanol, cement, and steel all have carbon burdens of about two tons; beef from corn-fed cattle is four tons; gasoline from petroleum is six tons, and electricity from coal almost ten tons.

AGRO 146
Life cycle emissions standards for biofuels: Transparency, representativeness, and uncertainties
***Adam J. Liska**, aliska2@unlnotes.unl.edu, Department of Agronomy and Horticulture, University of Nebraska, Walter Scott Engineering Center, Lincoln, NE 68588*

The Energy Independence and Security Act of 2007 requires standardized life cycle assessment (LCA) methods for regulating biofuel greenhouse gas (GHG) emissions. Regulatory LCAs “should be subject to a higher degree of quality (transparency about data and methods)” than related academic studies. When spatial, temporal, and technical information is accurately defined, corn-ethanol production is shown to not be adequately represented as a homogenous system, due to variability in crop production practices, biorefinery designs, energy sources, and co-product feeding practices. More representative data (including emissions factors) and more comprehensive documentation for biofuel and gasoline LCAs will enable improvement in estimated

emissions reductions. Analysis of recent survey data shows that corn-ethanol reduces GHG emission by 40-60% compared to gasoline. For indirect effects, comprehensive assessment of the cumulative GHG emissions implications of substituting biofuels for petroleum (all major changes in global carbon cycle) must be completed before indirect effects can be accurately determined.

AGRO 147
Extending life cycle assessment to include infrastructure required for a mature biofuels industry
***W. Michael Griffin**, mwg@andrew.cmu.edu, Green Design Institute, Engineering and Public Policy, Tepper School of Business, Carnegie Mellon University, Pittsburgh, PA 15213, and H. Scott Matthews, hsm@cmu.edu, Green Design Institute, Engineering and Public Policy, Civil & Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA 15213*

While there is interest in alternative fuels, substantial economic and technical challenges remain. The adoption of any alternative fuel requires changes throughout the supply chain. Even a liquid fuel like ethanol that is compatible with current infrastructure can induce dramatic changes, so accounting of infrastructure requirements is critical to a complete analysis of material flows and environmental impacts. We summarize several ongoing studies that evaluate transportation and infrastructure requirements for use of various ethanol blends in light-duty vehicles using a combination of corn and cellulosic ethanol. Ethanol distribution is modeled using a linear optimization model. We find emissions from ethanol transport are an order of magnitude greater than those in previous LCA studies, leading to larger life cycle effects. Long-distance transport of ethanol can negate potential economic and environmental benefits. To reduce costs, we recommend regional production and delivery concentration of E85 blends for future ethanol production and use.

AGRO 148
Life cycle assessment of ethanol in 2022
***David D. Hsu**[1], david.hsu@nrel.gov, Garvin Heath[1], garvin.heath@nrel.gov, Daniel Inman[2], daniel.inman@nrel.gov, Andy Aden[2], andy.aden@nrel.gov, and Margaret K. Mann[1], Margaret.Mann@nrel.gov. (1) Strategic Energy Analysis Center, National Renewable Energy Laboratory, Golden, CO 80401, (2) National Bioenergy Center, National Renewable Energy Laboratory, Golden, CO 80401*

The Energy Independence and Security Act of 2007 (EISA) mandates specific renewable energy market penetration targets for the year 2022. For liquid transportation fuels, the 2022 EISA mandate is 36 billion gallons per year (bgy) of biofuel of which 21 bgy must come from biomass feedstocks other than corn starch. Despite this legal mandate for renewable biofuels, many questions remain unanswered with regard to the potential environmental effects of such a large increase in the production and use of biofuels. The objective of this study is to use life cycle assessment to evaluate the global warming potential (GWP) and environmental emissions associated with the EISA-mandated 36 bgy biofuels target, which is assumed in this study to be met by a combination of corn starch-based and cellulosic-based ethanol.

AGRO 149
Biomanufacture of nanoparticle vaccines in plants
***Charles Arntzen**, Charles.Arntzen@asu.edu, The Biodesign Institute, Arizona State University, Tempe, AZ 85287*

Since the 1980's, recombinant DNA technology has increasingly been an important component of vaccine design and production. Vaccines to prevent infections by the Hepatitis B virus and human Pappiloma virus are major success stories in public health; these vaccines are biomanufactured using cultured yeast or insect cells. This technical approach could potentially be used to create new vaccines against other pathogens, but the high technology approach imposes substantial capital costs in production facilities. The progress that has been achieved in plant biotechnology to create new, cost-effective biomanufacturing systems for particulate vaccines against chronic and infectious disease will be discussed in this lecture. Plant viruses have been re-engineered to cause them to produce high levels of virus-like particles (nanoparticles) in tobacco plants over a one-two week time span. Rapid progress is underway to establish good manufacturing protocols to meet pharmaceutical standards needed for human clinical trials.

AGRO 150
Characterization of pesticide availability / bioavailability in soils
***William C. Koskinen**, koskinen@umn.edu, Soil and Water Management Research, USDA-Agricultural Research Service, St. Paul, MN 55108*

Availability/bioavailability of pesticides in soil is the integration of various processes and controls pesticide transport to water and air, exposure to and uptake by target and nontarget organisms, and degradation. Of the various processes, sorption-desorption is arguably the most important; it directly or indirectly controls all other processes. Characterization of availability has traditionally been through indirect methods such as the batch equilibration method to determine sorption coefficients and the amounts of aqueous and solvent extractable pesticide. Other methods include column techniques to determine pesticide in soil water at typical field moisture levels and isotopic exchange techniques, which determine unavailable pesticide. Direct methods include use of specific pesticide-degrading microorganisms. The potential problems/criticisms and advantages of these techniques will be discussed. After 40 years of research, there is still no universal method to characterize availability. The topic is wide open and we need to look for innovative methods. Some possibilities for future directions will also be discussed.

AGRO 151
Seeking the bridge between environmental chemistry and toxicology: Is there a relationship between physicochemical properties and body dose?
***Allan S. Felsot**, afelsot@tricity.wsu.edu, Department of Entomology, Washington State University, Richland, WA 99354*

Risk characterization depends on the integration of exposure assessment with toxicological benchmarks derived from dose-response testing of observed hazards. Exposure itself is rightly studied in the domain of environmental chemistry because it is dependent on thermodynamic principles that underlay the dynamics of physicochemical properties and phase transfers. The chemical residues likely to be encountered at the interface of an organism's integument represent an aggregate of all the chemodynamic influences on the chemical. To this end, countless experiments have proven sorption phenomena control bioavailability from an environmental matrix. However, the realm of the residue just at the surface of an organism and the realm within the organism have not been studied holistically, i.e., the environmental chemists seem to move in a different world than the toxicologists. Is the chemodynamic approach as applicable to predicting body dose as it is to predicting environmental bioavailability? For example, environmental modeling can predict residues at the body surface but is rate of movement across the body surface as predictable from physicochemical properties and phase-transfer coefficients? This presentation will use examples of historical studies from

the literature to illustrate the influence of sorption phenomena on toxicological effects and by implication diffusion across the integument. The review will focus on whether physicochemical properties are as predictive of integumental penetration as they are of environmental bioavailability. Finally, the presentation intends to make the case for coupling simple exposure assessment via measurement of environmental residues with a more mechanistic understanding of integumental penetration to improve prediction of internal body dose.

AGRO 152
Pesticide characteristics important to predicting volatile loss from foliar surfaces
***Jeffrey J. Jenkins**, jenkinsj@ace.orst.edu, Environmental and Molecular Toxicology, Oregon State University, Oregon State University, Corvallis, OR 97331-7301*

For pesticides deposited on foliar surfaces, observed volatile loss to the atmosphere is usually greatest soon after application. Henry's Law constant may be a good predictor of early volatile loss from spray droplets on the foliar surface. When deposits dry, the pesticide's vapor pressure may by a good predictor of volatile loss. As foliar surface temperature can vary significantly from ambient, enthalpy of vaporization may be useful in predicting volatile loss from dried deposits. When pesticide residues diffuse into epicuticular wax, the octanol-air partition coefficient may useful in predicting volatile loss. A pesticide's effective vapor pressure is a measure of source strength. However, pesticide flux from foliar surfaces is often limited by diffusion through the stagnant air layer, which varies with the molecular diffusion coefficient. Using these characteristics to predict pesticide volatile loss from foliar surfaces will be discussed.

AGRO 153
Pesticides in air: The evolving nature of agriculture air quality research
***Laura L. McConnell**, laura.mcconnell@ars.usda.gov, Beltsville Agricultural Research Center, USDA-Agricultural Research Service, Beltsville, MD 20705*

Many organochlorine insecticides are global pollutants, and emissions of these chemicals from contaminated soils will continue for many decades to come. Second and third generation pesticides are much less persistent, but they also enter the atmosphere despite extremely low vapor pressures. The efficacy of some currently used pesticides make fugitive residues more dangerous to sensitive species. While pesticide drift is fairly well understood, post-application volatilization from soils/plants is driven by a number of processes which are highly variable, and emissions are more difficult to estimate accurately. In addition, agricultural practices to reduce potential negative effects on non-target species will be different between crops and regions. Many agricultural practices are only examined from water and soil resource perspectives, and air quality is a secondary consideration. Now fumigants have been identified as contributing to ground-level ozone production in California, and solvents associated with pesticide emulsifiable concentrate formulations are also being examined as ozone precursors. Emissions from animal agriculture production (particulates, volatile organic compounds, ammonia, hydrogen sulfide) are under scrutiny, and emissions will now be regulated for large animal operations. What has not been examined closely are future scenarios as the pendulum swings back from very large agricultural operations located far from urban areas towards local production in smaller farms. It is likely that vegetable production, animal production and urban areas will be more closely linked in space and in the co-utilization of waste streams for bioenergy production. Can we extrapolate what we know now to predict how all these emissions will interact from a chemical perspective to effect air quality in the US? Can we design practices to avoid these problems before they occur? Advances in environmental chemistry and simulation models will be required.

AGRO 154
Pesticide environmental fate research for the 21st century: Building bridges between laboratory and field studies at varying scales
***Thomas L. Potter**, tom.potter@ars.usda.gov, Southeast Watershed Research Laboratory, USDA-Agricultural Research Service, 2316 Rainwater Road, PO Box 748, Tifton, GA 31794*

Accurate determination of predicted environmental concentrations (PECs) is a continuing and often elusive goal of pesticide risk assessment. PECs are typically derived using simulation models that depend on laboratory generated data for key input parameters (i.e., $t_{1/2}$, K_{oc}). Model flexibility in evaluating use scenarios makes them ideal tools for risk assessment; however, poor correspondence between PECs and field based measurement is common and often leads to a lack of confidence in model results. Environmental fate studies that bridge laboratory and field-based investigations are needed to close this divide. In this presentation we will discuss our recent studies and make proposals for a way forward.

AGRO 155
Genome of the cotton bollworm, Helicoverpa armigera
***Karl H J Gordon**, karl.gordon@csiro.au, CSIRO Entomology, Canberra, Australia*

The cotton bollworm, Helicoverpa armigera, is one the world's worst insect pests of agriculture, causing damage and control costs of at least $225 million/yr in Australia and $5 billion/yr globally. It is a highly successful polyphagous coloniser; three of its close relatives are also major pests. H. armigera has evolved resistance to every class of chemical pesticides applied to it and early signs of resistance to the two biopesticides now used against it have also been observed. Probably the best understood pest insect in the world in terms of its ecology, behaviour and pathology, it is difficult to sustain or inbreed colonies in the lab and the genetic bases for its ecological, evolutionary and biochemical phenomena have remained intractable. The complete genome (400Mb) of this insect is now being sequenced using next generation technologies. An overview of the genome and genes involved in resistance and host choice will be presented.

AGRO 156
Small molecule ligand discovery in Australia
***Timothy O'Meara**, timothy.omeara@csiro.au, Tim Adams, George Lovrecz, Olan Dolezal, Janet Newman, Tom Peat, and Jack Ryan. CSIRO Molecular and Health Technologies, Parkville 3052, Australia*

Small molecule ligand discovery in Australia has a strong tradition as exemplified by the development of Relenza, the first successful anti-viral drug against influenza. This presentation will set out a review of high-throughput methods and capabilities for targeted small molecule ligand discovery currently employed in CSIRO. The presentation will cover production of recombinant protein targets in a range of expression systems, purification of the recombinant targets, assessment of their function, high-throughput crystallisation of the targets and determination of their structure using x-ray diffraction. An overview of fragment based drug design will be provided including the use of surface plasmon resonance and nuclear magnetic resonance as rapid fragment based screening techniques. Development of lead compounds from fragment hits will also be discussed.

AGRO 157
Food residues and trade implications of insecticides used for post-harvest grain protection
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Grain crops including wheat, rice, and corn are subject to post-harvest damage by insect pests during storage, transport, and distribution. Pest management practices may include application of insecticides as protectants immediately prior to storage or by fumigation of storage bins. Issues which must be considered in such grain protection programs include insect resistance as well as worker and consumer safety. Major grain exporting countries such as Australia, Brazil, Canada, Russia, and the U.S. must also seriously consider how trace residues of pesticides remaining in traded grain may be impacted by maximum residue limit standards established by regulatory authorities in destination countries. International trade aspects are often complicated by a lack of harmonization of such standards among food exporting and importing countries. This presentation will review contemporary stored grain insect pest management practices and issues with an emphasis on Australian and U.S. perspectives. A case study involving development of the reduced risk insecticide spinosad for post-harvest grain protection will serve to illustrate the promises and pitfalls that may be associated with introduction of new technologies into this market.

AGRO 158
Ecdysone receptors as targets for the discovery of environmentally-friendly insecticides
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20-hydroxyecdysone controls the expression of gene networks during development and reproduction of arthropods. Ecdysone receptors provide targets for environmentally-friendly, order-specific insecticides. We have cloned full-length cDNAs encoding both EcR and USP subunits of ecdysone receptors from insect pests spanning four orders. Regions from within EcR and USP subunits have been co-expressed in a baculovirus system. A new fluorescence polarisation binding assay, suitable for high-throughput screening, has been developed employing sub-cloned ecdysone receptor ligand-binding fragments and a novel fluorescent ecdysteroid conjugate. The assay has been robotically automated to screen from a chemical library novel compounds that bind to ecdysone receptors and kill pest insects effectively. The three-dimensional structure of the B. tabaci, ecdysone receptor heterodimeric ligand-binding domain has been solved by X-ray diffraction. Hypotheses relating to the molecular mechanisms underlying binding selectivity of ligand chemistries for ecdysone receptors from different insect orders, and hence differential toxicity, will be presented.

AGRO 159
Isoxazoline insecticides
George P. Lahm, *george.p.lahm@usa.dupont.com, Thomas F. Pahutski, Jeffrey K. Long, jeffrey.k.long@usa.dupont.com, Ben K. Smith, Ming Xu, Caleb W. Holyoke Jr., caleb.w.holyoke-jr@usa.dupont.com, James D. Barry, Daniel Cordova, and Rejane Smith. DuPont Crop Protection, Stine-Haskell Research Center, Newark, DE 19714*

Isoxazoline insecticides, such as those containing 1-azole-[4-(5-phenyl-5-trifluoromethyl)-3-isoxazoline]phenyl groups, are broadly active across a range of insect and mite species. The compounds are active by both contact and ingestion and have shown good performance in a variety of field applications. Here, we report on the synthesis, biology, site-of-action and structure-activity trends for a series of heterocyclic derivatives of this type.

AGRO 160
Novel technologies for effective control of resistant insect pests.
Robin V. Gunning, *robin.gunning@dpi.nsw.gov.au, Tamworth Agricultural Institute, New South Wales Department of Primary Industries, Calala 2340, Australia*

Insecticide resistance is perhaps the largest problem in food and fibre production today. Annual world expenditure on agrochemicals is about US$ 25 billion, and sales from developing countries are increasing. Most insect pests have the ability to develop resistance to the chemicals used against them. Insecticide de-toxification is a major mechanism of insecticide resistance. Non-specific esterases are metabolic enzymes implicated in insecticide resistance in many insect pests due to hydrolysis and/or sequestration of the toxins. To try and overcome metabolic insecticide resistance, enzyme inhibitors called synergists have been used, but with an imperfect knowledge about the modes of synergist action. Our research, to better understand how synergists work, has led to a novel breakthrough in the science of insecticide resistance management. This technology is being developed to give agriculture and other pest control industries the means to effectively and economically control resistant pests.

AGRO 161
Role of databases in international MRL harmonization activities: Past experience and future developments
Sven-Erik Nielsen, *svenn@bryantchristie.com, Bryant Christie Inc, Seattle, WA 98101*

This presentation will examine the role MRL databases such as the USDA-EPA International MRL Database and the US-Canada Grower Priority Database play in international MRL harmonization efforts. The presentation will focus on current MRL policy issues around the world and how databases play an important role in ensuring that grower and food producer groups are able to adequately engage and prepare for regulatory changes in important markets. The presentation will also address the role databases can play in facilitating coordination and harmonization as governments and registrants undertake regulatory reform efforts for MRLs.

AGRO 162
Harmonization efforts through global joint reviews of new pesticide active ingredients
Lois Rossi, *rossi.lois@epa.gov, Office of Pesticide Programs, US Environmental Protection Agency, Arlington, VA 22202*

The simultaneous regulatory review of new pesticide active ingredients by multiple national authorities has increased substantially in the past several years. One primary objective of this initiative is to facilitate the global review of reduced risk pesticides and harmonize, as much as possible, the regulatory endpoints, residue definition and Maximum

Residue Limits for various commodities. Several new active ingredients have been jointly review by multiple national authorities and progress towards harmonization has been made.

AGRO 163
Efforts in residue chemistry harmonization: A crop protection industry perspective
***Volker Bornemann**, volker.bornemann@basf.com, Environmental and Consumer Safety, Agricultural Products Division, BASF Corporation, Research Triangle Park, NC 27709*

CropLife International, the global federation representing the plant science industry in 91 countries, has supported the global harmonization of residue chemistry guidelines and regulatory policies for many years. New products are typically developed for global markets and for uses in several geographic regions. However, non-harmonized guidelines and data requirements as well as differences in data evaluation and policies between national regulatory authorities lead to additional development costs, obstacles to work sharing between regulatory authorities, and trade barriers for internationally traded foods and feeds. The ongoing regulatory harmonization efforts of FAO, WHO, CCPR, and in particular, those of the OECD Residue Chemistry Expert Group, are actively supported by CropLife International and will hopefully lead to: faster review and regulatory decision-making; reduced redundancy in regulatory studies required; increased cooperation among regulatory bodies; higher quality of the monograph or review report; and more predictable timelines and outcomes for companies.

AGRO 164
Global minor use activities and progress
***Daniel L. Kunkel**, kunkel@aesop.rutgers.edu, Jerry Baron, Michael Braverman, Bill Barney, Johannes Corley, and V. Starner, IR-4 Project, Rutgers - The State University of NJ, Princeton, NJ 08540*

With increasing global trade of specialty / minor crops, there is a greater focus on pesticide use on these crops. Several organizations such as the OECD, Codex, and NAFTA have active committees working to find solutions to minor use issues. In December of 2007 there was a Global Minor Use Summit held at FAO Headquarters in Rome, Italy. Some of the action items from this summit include: regulatory and data capacity building in developing countries; establishment of committees and working groups, especially in Codex; and a number of pilot projects including global joint reviews and global residue studies/zones. There was also broad agreement to develop a globally-harmonized classification system of commodities and commodity groups that utilize data extrapolation for the establishment of global MRLs. An update will be provided with regard to each of these activities that support global minor use pesticide registration.

AGRO 165
OECD harmonized MRL calculator
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Currently, individual countries and organizations have different approaches to calculating MRLs from underlying residue data. This disparity is one of the major deterrents in the effort to harmonize MRLs globally. In the Spring of 2008, to promote international harmonization for the process of establishing MRLs, the OECD Residue Chemistry Expert Group (RCEG) charged a technical working group with the challenge of creating an automated spreadsheet for calculating MRLs that will harmonize the current EU and NAFTA procedures. The new harmonized MRL spreadsheet, referred to as the OECD MRL Calculator, while still under development, has been released as a draft version for feedback from the RCEG experts and regulators. The functionality and performance of the draft OECD MRL Calculator will be described and demonstrated with typical field trial residue data. Challenges associated with the harmonization of the statistical and non-statistical "regulatory" aspects of MRL setting procedures will also be discussed.

AGRO 166
Proposed approach for global residue programs
***Carmen Tiu**, tcarmen@dow.com, and Kenneth D. Racke, kracke@dow.com, Dow AgroSciences, Indianapolis, IN 46268*

A global residue package could produce more robust data by including trials conducted under representative climates, soils, use patterns and pest intensity from around the world. Such a program could be conducted with a similar number of trials as currently required by national regulations, while promoting harmonized GAPs, enabling harmonized MRLs and offering significant benefit to global trading of ag-commodities. A quantitative approach towards the "Ideal Global Residue Package" could determine the minimum number of trials by crop by assigning scores for low, medium, high contribution to each of three variables: crops planted area, intensity of food/feed consumption, and frequency of trading. The range of total scores could be sub-divided into four suggested categories requiring between 6 trials minimum (Codex) and up to 15 trials. Each crop usually grows in the same type of climate and biome present across continents, regardless of the longitudes and with slight difference between latitudes. Therefore, the number of trials required by crop can be distributed in at least two representative countries from N and S-hemisphere.

AGRO 167
Chlorantraniliprole: A case study in global MRL harmonization
***Janet C. Ruhl**, janet.c.ruhl@usa.dupont.com, Kathy M. Jernberg, and Michael D. Woodward, Stine-Haskell Research Center, DuPont Crop Protection, Newark, DE 19714*

In early 2007, chlorantraniliprole, an insecticide belonging to the anthranilic diamide class of chemistry was submitted for registration in Australia, Canada, the EU and the United States as part of an OECD Global Joint Review. A goal of the submission was to achieve harmonized residue definitions and MRLs in the participating countries. This goal was approached by submitting various regional residue data packages and proposing harmonized MRLs/tolerances based on the data from the region with highest observed residue population, regardless of whether the highest residues resulted from domestic use or imports. In late 2007, the chlorantraniliprole residue data package was re-submitted to the EU to specifically request Import Tolerances and was, in parallel, submitted for a 2008 JMPR review with Codex MRLs setting expected in 2009. In a similar time frame, chlorantraniliprole registrations were requested in Japan and New Zealand, referencing the DuPont-proposed harmonized MRLs. At this time, we will review these efforts and outcomes in light of continuing Global/OECD MRL harmonization efforts.

AGRO 168
Can MRLs be harmonized globally?
Audrey W. Chen, *audrey.chen@fmc.com, Residue Chemistry, FMC Corporation, Princeton, NJ 08543*

Harmonization of crop MRLs has become a popular topic recently. It is apparently necessary under global trade and the benefits are many folds beyond description. However, the harmonization process is in slow progress even though a great deal of time and efforts have been attempted regionally and internationally. So, what are the problems? Do people really understand what MRL harmonization means? Thinking outside the boxes and compromises maybe necessary to reach the goal. A simple example (zeta-cypermethrin MRLs in a crop in US, EU and Codex) will be presented to demonstrate a possible approach toward global MRL harmonization. The primary elements (application rates, pre-harvest intervals, residue values, and calculators) which decide the MRLs and other criteria (ADIs and dietary risk calculations) which MRLs inevitably depend upon will be compared. The possible solutions (decline data, residue proportionality, and global zones) that can be applied to aid harmonization will be described as well.

AGRO 169
Using exergy to assess sustainability of biofuels
Krzysztof J. Ptasinski, *k.j.ptasinski@tue.nl, Department of Chemical Engineering, Eindhoven University of Technology, Eindhoven 5600 MB, Netherlands*

A wide range of biomass sources, such as traditional agricultural crops, residues from agriculture, and foresting, can be used to make biofuels and bioproducts. However, the use of biomass is accompanied by ecological drawbacks, particularly limitation of land or water and competition with food production. For biomass-based systems, a key challenge is to develop sustainable technologies based on criteria including thermodynamic efficiency in addition to environmental and economic aspects. Exergy-based thermodynamic efficiency is a convenient tool to select promising biomass-to-biofuels routes. This assessment relates to biomass gasification and subsequent biofuel synthesis, including Fischer-Tropsch hydrocarbons, methanol, and hydrogen. It is shown that all investigated routes have lower exergetic efficiency compared to fossil fuels. The conversion efficiency can be increased by improving the operation of biomass gasifier which shows the highest exergy losses.

AGRO 170
Bioenergy and sustainability forestry
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One of the greatest challenges facing forest managers in the United States on both public and private land is restoring, maintaining, and enhancing the health and resilience of forest ecosystems. Climate change is likely to exacerbate forest health problems in many parts of the country. A warmer climate could also increase the risk of wildfires and increase the susceptibility of forests to large-scale insect and disease epidemics. When woody biomass is converted to energy and energy products, there are benefits of renewable energy and associated displacement of fossil fuels. This also creates a market for material that otherwise causes a disposal problem. Developing renewable systems such as growing trees for energy crops on private lands has gained considerable attention and support, but has also generated concern about sustainability. Maintaining healthy working forests and utilizing by-products of forest management actions allows both sequestration and biofuels production to occur on the same acres.

AGRO 171
Advancing biofuels: Balancing for sustainability
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As with most technologies, use of biofuels has both benefits and risks, which vary by feedstock. Expected benefits include increased energy independence, reduced consumption of fossil fuels, reduced emission of greenhouse gases, and invigorated rural economy. Anticipated risks include potential completion of use of feedstock and an undesirable shift in land use. Technology is rapidly advancing to utilize a diverse array of nonfood feedstocks (e.g., crop residue and perennials) for producing ethanol via a cellulosic platform and/or utilizing pyrolysis to generate syngas and other products/co-products. These feedstocks traditionally have been returned to the soil; therefore harvesting those feedstock needs to be balanced with maintaining soil quality. Strategies for achieving sustainable harvest of cellulosic feedstocks include limiting harvest rates or frequency, utilizing cover crops, and adding perennials into the crop rotation. It is imperative that the soil resource be preserved so that food, feed, fiber, and fuel can be produced.

AGRO 172
From waste biomass to valuable bioproducts: An E^3 (energy, environmental, economic) profit strategy
Wei Zheng[1], *wzheng@istc.illinois.edu, Nandakishore Rajagopalan*[1], *kishore@istc.illinois.edu, and Mingxin Guo*[2], *mguo@desu.edu, (1) Illinois Sustainable Technology Center, University of Illinois, Champaign, IL 61820, (2) Agriculture and Natural Resources Department, Delaware State University, Dover, DE 19901*

Biomass as a renewable resource is receiving great attention since it is recognized as a potential alternative to fossil fuels. Agricultural residues and yard wastes are widely available biomass sources for the bioenergy production. The thermochemical conversion of waste biomass is an attractive approach to produce a series of energy products such as syngas, bio-oil, and biochar. Bio-oil is a renewable and greenhouse-gas-neutral fuel and could be used at petroleum refineries as a feedstock. Biochar can be used as a soil amendment to sequester atmospheric carbon into soil, improve soil quality, and prevent soil erosion. In the present study, we developed a pyrolysis system to produce bioproducts from a variety of waste biomass. The effects of a range of pyrolysis conditions on the quality and quantity of bioproducts were investigated. A laboratory experiment was conducted to explore the sorption capacity of biochar on inorganic (including ammonium ion, nitrate, and phosphate) and organic contaminants (including four heavily used pesticides). Effects of the production conditions (such as pyrolysis temperature) on removal of these contaminants were comprehensively assessed. This study indicates that the use of biochar in soil may reduce the use of chemical fertilizers and minimize the adverse effects of agrochemicals on the environment. Additionally, a sustainable bioenergy strategy regarding bio-fuel production integrated with biochar to soil will also be proposed and discussed.

AGRO 173
Developing sustainable strategies for biodiesel synthesis using high fatty acid feedstock
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The increasing costs and decreasing availability of imported petroleum oil have led to the call for sustainable solutions to transportation fuels. Biofuels such as biodiesel (BD) have received considerable interest because of their renewable nature. The first generation BD production utilizes refined vegetable oil, making the process not cost-competitive. Furthermore, a substantial amount of water is required for the removal of salt contaminants from BD. To address these issues, heterogeneous catalysts have been developed for the production of BD using waste greases with high free fatty acid (FFA) content. Esterification of FFA in greases to fatty acid methyl ester (FAME) using supported acid catalysts, such as diarylammonium salts immobilized onto organic polymers or mesoporous silica materials, will be discussed. This approach may provide a potentially more sustainable solution for biodiesel synthesis using readily available FFA feedstock.

AGRO 174
Co-encapsulated glucose isomerase and yeast as cost-efficient biocatalyst for biofuel production from hemicellulose hydrolysate
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It is a social and scientific imperative that alternative, carbon neutral, sustainable fuel sources be developed and implemented. Ethanol is one such potential fuel for vehicular use, being theoretically carbon neutral, derived from renewable biomass, and having low environmental impact. More significantly, ethanol technology is a currently implementable solution, and can be used until more alternatives, such as hydrogen fuel cells, can be fully developed. One limitation to the production of ethanol via fermentation, however, is having a large enough supply of biomass to meet current and future demands. Approximately 70% of the dry mass of plant derived biomass is polysaccharides in the form of cellulose and hemicellulose, from which monosaccharides for fermentation can be derived. Of this, up to 40% is xylose, a non-fermentable pentose sugar. To increase the amount of ethanol produced from a given amount of biomass, we have co-immobilized *Saccharomyces cerevisiae*, brewer's yeast, with xylose isomerase (XI), to convert xylose to a fermentable form, in an artificial, perm-selective capsule. XI is immobilized on a polymer to prevent leaching from the capsule, provide additional activity protection, and prevent consumption by the yeast. These capsules have xylose and hexose fermentation capabilities, are stable over multiple fermentation cycles, provide enhanced fermentation efficiency, and lowers costs associated with the use of enzymes. Presented herein is the development and scale-up of these capsules, optimization of fermentation conditions, and characterization of fermentation efficiency on glucose and xylose feedstocks. The co-encapsulation we have developed provides a simple, economically feasible, and efficient method for the production of ethanol from currently used biomass as well as otherwise waste materials.

AGRO 175
Pesticide environmental fate from the microbial to the international levels
Kenneth D. Racke*, kracke@dow.com, Dow AgroSciences, Indianapolis, IN 46268*

Pesticide environmental fate is governed by a variety of important processes and may be significantly affected by microorganisms active in soil, water, and organic materials. Pesticide degradation by microorganisms may occur incidentally as a byproduct of microbial activities or with enhancement of microbial growth due to the ability of pesticides or metabolites to serve as carbon, energy or nutrient sources. In addition to contributing to a basic scientific understanding of pesticide fate, insights on microbial degradation may also have important commercial and regulatory implications. In the scientifically emerging parts of the world, attention to pesticide environmental fate considerations is increased where basic product quality and human safety priorities have been addressed. As research and regulatory schemes advance on a worldwide basis, there is a strong need for environmental scientists to consider the international relevance and transferability of their pesticide fate work. It is the obligation of fate scientists to promote widespread availability of their research results, to actively participate in the international dialogue regarding pesticide environmental considerations, and to contribute to the development of good scientists and sound application of environmental science in developing regions of the world.

AGRO 176
Terrestrial field dissipation study: A research tool for elucidating pesticide environmental fate
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There is now a long history of studying pesticide environmental fate with field studies, and data from field dissipation studies are commonly required by regulatory agencies. Despite the widespread recognition that field studies provide a valuable synthesis of degradation and transport mechanisms of dissipation, conclusions from the studies are often challenged. Questions may arise because of differences between study results and expectations based on laboratory data, limitations in the study design, variability in environmental conditions, and uncertainties in extending the field study results to a wide geographical area anticipated for use of the pesticide. Concerns over the uncertainties often prove fatal to the process of drawing conclusions from field studies, but the concerns also indicate directions for research on pesticide environmental fate. As computer models have become reality for pesticide exposure assessments, the field dissipation study has come to be seen as a test of the model rather than a source of insight or knowledge. Developments in the design and execution of field dissipation studies are critical if the study is to remain a research tool for elucidating pesticide environmental fate.

AGRO 177
Past, current, and future environmental risk evaluations in the Netherlands and the European Union
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In retrospect, the development of the environmental risk evaluation in The Nether-lands are dealt with over the last 30+ years. In 1975, the Dutch pesticide law was adjusted to include several environmental topics as the degradation in soil, the sorption to organic matter and ecotoxicological data for organisms in the environment, like birds, fish, daphnids and algae. At a later stage degradation in water / sediment sys-tems and toxicity for earthworms were added. Some time was allotted to industry to adjust their dossiers to the

new requirements. From 1988 onwards the environmental risk assessment for pesticides got a serious start in The Netherlands with a project to catch-up the evaluations for about 150 pesticides to the current standard. At this moment The Netherlands started with the application of the first groundwater assessment tool and a simple model for the establishment of concentrations in surface waters based on spray-drift. In the early 90s the evaluation started on an EU-scale and more and more internationally accepted tools became standard practice. Current research developments concern probabilistic tools and the political questions on risk assess-ment and risk management. Especially Don Wauchope's role in the European arena will be highlighted. Finally, the way forward is explored in a sustainable use of pesti-cides on a worldwide scale with increasing awareness of risks, possibilities and neces-sities.

AGRO 178
Regulatory modeling for pesticide aquatic exposure assessment
***Ronald D. Parker**, parker.ronald@epa.gov, Office of Pesticide Programs, U.S. Environmental Protection Agency, Washington D.C, DC 20460*

The OPP Environmental Fate and Effects Division (EFED) are charged with carrying out both drinking water exposure assessments for FQPA and aquatic ecological exposure / risk assessments mandated by FIFRA. These risk assessments are based on comparing the estimated environmental pesticide concentrations that are expected from normal use (exposure) to known toxic concentrations based on laboratory testing (effects). The Agency relies on a combination of field monitoring and computer simulation modeling. The two approaches used together have a synergy in which each compliments the other in a way that enhances predictive ability far beyond the capacity of either one by itself. The availability of increasingly large pesticide exposure data set and new generations of pesticide fate and transport models opens new options for exposure assessment. What might the future of exposure assessment look like, given these new opportunities?

AGRO 179
Investigating riparian buffers impact on pesticide fate using the Riparian Ecosystem Management Model
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The Riparian Ecosystem Management Model (REMM) is used to estimate the effects of buffer size, vegetation, and soil properties on the movement and fate of pesticides. REMM simulates the interactions of water, sediment, carbon, nitrogen, phosphorus and pesticide properties that control pesticide dynamics in buffers. Pesticides enter and move through the buffer system based on their soil sorption coefficient and their half-life in soil. The partitioning can be affected by the ionization of the pesticide based on soil pH. Pesticides are bound in litter based on a binding half life. Uptake of pesticides by vegetation is based on the octanol/water partitioning coefficient. Both binding and plant uptake are treated as sinks. Pesticides in solution or adsorbed to soil and sediment are subject to transport and/or degradation. REMM simulates processes that are important to buffer function such as infiltration/exfiltration, litter (residue) interception of water and chemicals, and interactions of surface runoff and groundwater. The use of REMM to investigate the effects of buffer properties important to pesticide dynamics will be illustrated.

AGRO 180
Water quality metrics for tracking sustainability of cropping systems
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Agricultural systems face a growing challenge to sustainably meet the accelerating demand for food, feed, and fuel, while also minimizing the environmental footprint of crop production. It is widely recognized that cropping systems have the potential to impact water supplies, thus there is an acknowledged need to drive the adoption of new agricultural technologies and new conservation practices to help preserve and improve water quality. In order to facilitate this process and to track progress on reducing any impacts of US crop production, a broad group of companies and other organizations have formed the Keystone Alliance, which is developing a series of metrics for quantifying the sustainability of agricultural systems. This presentation will focus on the water quality metric, which presents unique challenges due to questions around scalability and properly ascribing water quality impacts to a particular cropping system, given the variety of other potential sources across the landscape.

AGRO 181
USDA-ARS research programs address scientific knowledge gaps in air quality and provide sound mitigation strategies
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Emissions from agriculture to the atmosphere affect air quality, increase atmospheric greenhouse gas (GHG) concentrations, and are under increased scrutiny due to potential negative environmental effects and threats to human and animal welfare. Major classes of emissions include particulate matter (PM), volatile inorganic compounds (primarily ammonia and hydrogen sulfide), volatile organic compounds (VOCs), and those from pesticides. Often these emissions exist as mixtures and, thus, adjustments to production practices for abatement may decrease the release of one material while changing the emission character or magnitude of other materials. ARS is conducting studies to gain a more comprehensive understanding of emission, fate, transport, and deposition processes. The variability of the atmosphere, soils, and plants, and the complexity of interactions among these systems require formal and informal collaborations and efficient, effective assimilation of data between projects into readily available databases. These efforts will lead to development and evaluation of measurement techniques and protocols, models describing and predicting emission, fate, transport, and deposition, and emission abatement and mitigation technologies.

AGRO 182

Identifying key odorants off-site from animal feeding operations

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Odors from animal feeding operation are one of the most significant emissions at the local level. Current methods used to measure agricultural odor are biased and inadequate. The purpose of this study was to evaluate two different techniques in their ability to identify key odorants. The first technique ranks odorants by its odor activity value (OAV, ratio of an odorous compounds concentration in air to its odor threshold level). The second technique, GC-O (olfactometry), ranks odorants based on response of human panelists. Air samples were collected on sorbent tubes and thermally desorbed for GC-MS analysis. Samples were collected directly from source site (cattle feedlot and swine facility), 0.25 miles, and over 1-2 miles downwind from the facility. Key odorants detected at the source included sulfide compounds, oxazoles, volatile fatty acids, phenolic compounds, and indole compounds, while further downwind odors were mainly assoicated with indole compounds and some phenol compounds.

AGRO 183

Chemical and olfactometric analyses of malodors associated with land application of biosolids

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Malodors emitted from municipal biosolids limit the public acceptance of utilizing these potentially natural organic resources in agriculture. This study aims to identify major odorants and to evaluate odor intensities associated with biosolids application before and after stabilization with lime and fly ash. Biosolids were applied to mini-plots (clayey soil) which were then monitored for a period of one month. Volatile organic compounds (VOCs) were determined using headspace solid phase microextraction (HS-SPME) followed by GC-MS analysis. Odor intensity was evaluated in the field using a Nasal Ranger and a special "sniffing chamber". The main findings are: 1. A characteristic chemical fingerprint is found for municipal biosolids headspace. 2. Alkaline stabilization results in substantial odor emission (mainly from ammonia and N-compounds) and does not reduce odor emissions after application. 3. Odorous VOCs may be generated in the soil after application. 4. Dimethyl disulfide and dimethyl trisulfide seem to correlate with malodor intensities associated with biosolids application, thus suggested as potential chemical markers.

AGRO 184

Measuring volatile reduced sulfur compounds from swine houses by gas chromatograph with amperometric sulfur detector (GC-ASD)

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Volatile reduced sulfur compounds (RSC) have a significant impact on odor nuisances from swine houses due to their low solubility in slurry and their very low odor threshold values. In the process of developing odor emission reduction technologies, it is necessary to have a reliable method for measuring key odorants. A method with collection of air from swine houses in sampling bags and subsequent analysis on a gas chromatograph with amperometric sulfur detector is presented. The storage stability of RSC in sampling bags made of polyvinyl flouride and polyethylene terephthalate for up to 72 hours was investigated. The sampling bags were tested with a standard gas containing hydrogen sulfide, methanethiol and dimethyl sulfide, and the significance of humidity on storage stabilities was examined. Air samples from a swine house were collected to demonstrate the use of the method in practice. The applicability and limitations of the method will be discussed.

AGRO 185

Development of a novel and sensitive thermal desorption method for the determination of key odorants from animal feeding operations

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In recent decades, intensive large-scale livestock production has grown rapidly in the U.S. and other parts of the world. The large number of animals raised in concentrated animal feeding operations (CAFOs) can affect air quality by emissions of odor, volatile organic compounds (VOCs) and other gases, and particulate matter (PM). The NRC report identified odors as the most significant animal emission at the local level. Nuisance odors related to intensive commercial animal operations have been implicate as a cause of decreased quality of life and declined property values for surrounding communities. In this study, an analytical method based on a novel thermal desorption system coupled to multidimensional gas chromatography mass spectrometry and olfactometry has been developed and validated for monitoring of twenty key odorants including sulfur containing compounds, VFAs, phenolics and indolics from two swine and two dairy farms. The whole air samples were collected by sampling air from the barn through Tenax TA. Samples were analyzed by directly thermal desorption and subsequent simultaneous chemical and odor analysis.

AGRO 186

Downwind odor sampling strategies for transient events utilizing combined metalized-FEP gas sampling bags, sorbent tube transfer and thermal reconstitution

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Downwind odor impact can be very different depending upon the size of the upwind point-source, interim topography and wind pattern. At one extreme, the downwind odor plume from a relatively large CAFO can be rather broad, sustained and predictable relative to a fixed downwind receptor site. Conversely, the plume from a small point-source such as a

small vent stack can be intermittent and fleeting. These transient odor events can be surprisingly intense and offensive. This work reports on efforts by the authors to develop a downwind odor sampling strategy which is optimized for such transient odor 'spikes'. Initial results, for example, have shown ~10 fold increases in target odorant yields for adsorbent tube collection and transfers from two second 'burst' odor event bag-captures; when compared to equivalent direct collections during perceived odor 'lull' periods. Results-to-date targeting refinement and validation of this integrated strategy for 'transient' odor events will be presented.

AGRO 187
Quantification of odorant emissions from swine houses by proton-transfer-reaction mass spectrometry (PTR-MS)
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Quantification of odor as odorants from intensive livestock facilities is needed for documentation and optimization of emission reduction technologies. Such measurements are challenging due to the complexity of odor samples from livestock facilities and the reactivity as well as low odor threshold values of certain odorants. In this work, Proton-Transfer-Reaction Mass Spectrometry (PTR-MS) is presented as a quantitative, selective and sensitive on-line method The detection of a range of odor compounds, including volatile reduced sulfur compounds, trimethylamine, carboxylic acids, phenols and indoles, is demonstrated. The internal calibration of the instrument is compared to a permeation tube calibration. The instrumental detection limits are below 100 parts-per-trillion with a response time of less than 1 second. Data from measurements on ventilated air from an experimental full scale swine house is presented and compared with off-line measurements. The influence of sampling conditions (e.g., humidity) is discussed.

AGRO 188
Evaluation of EPA approved FRM PM10 samplers
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Accurate measurement of particulate matter (PM) concentrations in ambient air is becoming increasingly important as regulatory agencies continue to enforce more stringent limits on PM concentrations to which the public may be exposed. However, previous theoretical research has indicated that significant biases are associated with the use of federal reference method (FRM) PM samplers in the presence of large PM such as that generated by many agricultural operations. Furthermore, field sampling has indicated that sampler performance may be affected by external variables such as dust concentrations, dust characteristics, and wind speed. The objective of this paper is to determine the actual cut-point and slope of two types of EPA-approved FRM PM10 samplers using the controlled conditions of a wind tunnel with poly-disperse dusts having varying particle size distributions (PSDs) at different wind speeds and concentrations.

AGRO 189
Stripping of herbicides from atmospheric particulates during high-volume air sampling
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High-volume air sampling, in which air is aspirated first through a glass fibre filter and then polyurethane foam (PUF), is commonly employed during atmospheric monitoring for pesticides. The fraction of pesticide associated with particulates is captured on the filter and the vapour fraction is sorbed by the PUF. However, the particulate fraction may be underestimated because some pesticides may be stripped from captured particles due the pressure drop created by the high flow of air through the filter. Stripping of seven acid and three neutral herbicides, commonly used on the Canadian prairies, from fortified heavy clay dust evenly distributed on the glass fibre filter of a high-volume air sampler was studied using an aspiration flow rate of 25 L/min for a 7-day period. The proportion of the herbicides stripped as vapour from the fortified dust was determined by extraction and analysis of herbicide retained on the PUF plugs.

AGRO 190
Runoff transport of pyrethroids from a residential lawn in central California
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An irrigation runoff study on a residential lawn was conducted in central California during the summer/fall of 2008 to investigate the contribution of turf uses of pyrethroids to residues in Californian urban creek sediments. The study included liquid and granular applications of both bifenthrin and beta-cyfluthrin. Generally, runoff did not occur at irrigation rates of 0.8 inches/hour but did occur when the irrigation rates were increased to about 1.5 inches/hour, resulting in losses in the first runoff event of up to 0.58 and 0.08 percent of applied for beta-cyfluthrin and bifenthrin, respectively. Runoff losses were generally smaller for liquid formulations than granular formulations, but within a factor of three. Additionally, the study examined runoff eight weeks after application using simulated rainfall to represent a winter rainstorm. Runoff losses were 0.01% of applied or less for all plots, with lower losses for plots where runoff did not occur during the irrigation season.

AGRO 191
Monitoring pesticides in urban stormdrain and surface waters in four metropolitan areas of California
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The average annual non-residential urban pesticide use in California from 1995-2005 was ~14 million pounds of active ingredients. Based on comparison of pesticide use and sales data, pesticide applications in urban areas account for ~70% of pesticide sales in California in 2005. Urban use pesticides may cause toxicity to sensitive aquatic species. We will present monitoring information and preliminary results from a total of 25 monitoring stations located in four metropolitan

areas of California: the San Francisco Bay, Sacramento, Los Angeles, and San Diego. Water and sediment samples collected from urban stormdrains and/or streams were analyzed for insecticides (pyrethroids, carbamates, organophosphates, and fipronil and its degradates) and herbicides (including dinitroanilines, triazines, and phenoxy acids). Data will be compared with available water quality benchmarks, stormdrain water vs. receiving water, and stormwater vs. baseflow water.

AGRO 192

Washoff/runoff of cypermethrin residues from slabs of external building material surfaces using simulated rainfall

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A study was conducted to examine the potential for simulated rain to wash off applications of pyrethroids to different external building materials utilizing a laboratory research track sprayer and indoor laboratory rainfall simulator in October 2008. Cypermethrin formulated as Cynoff® EC Insecticide and Cynoff® WP Insecticide was applied at the maximum label rate to ten different building material types. Three treated replicate rectangular slabs per building material and formulation were then subjected to a one-hour, one-inch-per-hour rainfall event. In the rainfall simulator, the slabs were placed at a angle of 30 degrees from the vertical. Washoff quantified from this study ranged from 17 to <0.01 of percent applied mass of cypermethrin for Cynoff® EC Insecticide and ranged from 11 to 0.07 of percent applied mass of cypermethrin for Cynoff® WP Insecticide, with generally more runoff occuring from smooth surfaces such as vinyl and aluminum and less from rough surfaces such as unpainted stucco.

AGRO 193

Pollutants in runoff from residential sources

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Samples of runoff from eight residential areas in Sacramento and Orange Counties were collected every 1-2 weeks beginning in mid-2006 and analyzed for pesticides including organophosphates (2), pyrethroids (9), and fipronil; pathogens and surrogates (8 total); nutrients (N and P); and drinking water constituents of concern (7). Flows from these sites were also measured. This information is being used to characterize runoff from these sources, refine models of dry season pollutant loading, and promote beneficial landscape management methods. Results from this comprehensive sampling and monitoring study revealed high detection frequencies of pesticides, pathogens, and surrogates at all sites and apparent diurnal and weekly flow patterns. Preliminary model testing shows that current models may underestimate pollutant loading by as much as 50%. Outreach occurs at half of the study sites and effectiveness is measured through surveys of homeowner activities. Continued long term monitoring may verify adoption of pollutant reducing landscape management methods.

AGRO 194

Pesticide detections in residential irrigation runoff

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In a statewide collaborative project characterizing irrigation runoff from single family residential developments, four neighborhoods each in Sacramento and Orange Counties were selected for monitoring. Irrigation runoff grab samples were collected at outfalls every 1-2 weeks during dry periods to determine presence of pesticide residues as well as concentrations when present. Samples were analyzed for the following pesticides: diazinon, chlorpyrifos, pyrethroids, and fipronil. In addition, an intensive weekly sampling study was conducted in the summer of 2008 in both counties. Irrigation runoff samples were collected every hour and composited into 3-hr samples over seven days to determine concentration fluctuation during the week and throughout the day. Pesticides in irrigation runoff from Orange County generally exceeded concentrations found in runoff from the Sacramento study sites in both the weekly sampling and the intensive study. However, similar types of pesticides were detectable in all eight residential neighborhoods.

AGRO 195

Pyrethroid partitioning between water and suspended sediments in urban and agricultural creeks

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Pyrethroid insecticides are highly hydrophobic compounds (log Koc greater than 5) that easily partition out of the dissolved phase. For this reason, most water samples collected for pyrethroid analysis are analyzed as whole water (dissolved and suspended phases). Water samples (1 L), collected from urban and agricultural drains and creeks in California, were separated into suspended and dissolved phases via glass-fiber filtration. Pyrethroids associated with the suspended sediment were detected in all six samples but only three of the samples had detectable pyrethroids in the dissolved phase. In all cases, the majority of the mass (68 to 98%) was associated with the suspended sediment. Method detection limits were 2-6 ng/L for water and 10-26 ng/g for the suspended sediments (assuming 500 mg/L of suspended sediment); these were further lowered by using tandem mass spectrometry to 0.5 to 1 ng/L and 2 to 6 ng/g, respectively.

AGRO 196
Transport of insecticides to urban streams: Conceptual models and perceptions
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In California, various academic and industry studies have detected pyrethroid insecticide residues in depositional sediments in streams dominated by both urban and agricultural land-uses. The California Department of Pesticide Regulation has instituted a re-evaluation of pyrethroid insecticides and a substantial fraction of the new studies requested as part of this program relate to urban uses of these compounds. Among the difficulties that the Pyrethroid Working Group (PWG) has experienced in designing suitable urban-related studies have been understanding the contributions of various potential routes of exposure as well as the significance of detection in depositional sediments. Among the confounding factors have been incorrect preconceptions of the significance of various use patterns, lack of spatially specific urban use data, the impact of sampling methodologies and the lack of exposure scenarios relevant to California. The presentation will examine how thinking on some of these topics has developed over the last few years.

AGRO 197
Scientific and ethical reviews of exposure assessment methods
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In order to ensure that the current approaches used in the exposure assessment process by the U.S. EPA meet the highest standards for scientific validity and comply with all appropriate ethical standards of study conduct, the Agency has engaged in several recent peer review efforts. Key scientific issues have included the use of dosimetry as a sampling method, statistical study design, and data analysis. Ethical study conduct has also been a focus and the issues which have been discussed include the recruitment of subjects for participation in research, ensuring the health and well being of subjects who participate in research, and issues related to informed consent to participate in research. These reviews are conducted by the FIFRA Scientific Advisory Panel (SAP) and the Human Studies Review Board (HSRB), both of which are established under criteria outlined in the Federal Advisory Committee Act (FACA). An overview of the process associated with the SAP and HSRB will be presented as well as an examples of recent reviews related to exposure assessment methods.

AGRO 198
Establishment of the Human Studies Review Board (HSRB)
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In an effort to increase the knowledge of cholinesterase inhibition in humans, pesticide registrants have submitted human clinical studies. Intense controversy ensued over the use of these human data and the EPA subsequently sought advice from the FIFRA SAP, the SAB as well as from NAS. Citing these reviews, EPA issued a proposed rule establishing the Human Studies Review Board and 'raising the bar' required before such studies could be conducted. The proposed rule specifically excluded agricultural exposure monitoring studies; and, while there was no public objection to this stance, the Final Rule, effective April 7, 2006, included these studies. The first HSRB public meeting was held April 4-6, 2006; eleven such meetings have occurred as of October 2008. In addition to reviewing AHETF proposed studies, HSRB reviewed studies on insect repellents, hexavalent chromium, and protocols submitted by the antimicrobial exposure assessment industry task force.

AGRO 199
Impact of Human Studies Review Board on agricultural worker exposure studies
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In February 2006, the Final Rule strengthening existing protections for human volunteers in research studies was enacted. Along with extending new protections to subjects involved in pesticide research, the law created a new, independent Human Studies Review Board (HSRB) to advise the EPA on the ethical and scientific issues arising in such research. The process for gaining approval to conduct studies involving human volunteers has changed radically. Standard protocols that have been used for decades to conduct occupational exposure monitoring studies have been transformed as a result of input from HSRB. Many changes provide additional protections and rights for the volunteers. Additionally, the HSRB has had an impact on the science aspects of study protocols, including enhancement of the study objective, review and discussion of existing exposure data, new statistical considerations, and fundamental changes in test subject identification and recruitment.

AGRO 200
Comparison of deterministic and probabilistic approaches to estimating pesticide handler exposures
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Pesticide handler dermal and inhalation exposures are typically estimated from a simple relationship of unit exposure (mg/Lb active ingredient handled, AI) x (acres treated/day) x (Lb AI/acre) / (kg bodyweight). With a dermal absorption parameter, systemic dose may be estimated. The parameters are usually based on conservative conventions that tend to maximize estimates. Because the parameters are deterministic, conservative, and multiplicative, the resulting estimate represents an unknown percentile of handler population or individual handler exposure and dose. In a series of case studies, the deterministic approaches used by the U.S. Environmental Protection Agency and the California Department of Pesticide Regulation were compared with probabilistic (Monte Carlo) approaches. Sensitivity analyses identified the most important parameters and areas where uncertainties could be reduced.

AGRO 201
Experimental design of AHETF exposure monitoring studies
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The Agricultural Handlers Exposure Task Force (AHETF) is conducting studies to measure agricultural worker exposure for a generic exposure database. Studies are designed to characterize potential worker exposure under precisely defined sets of agricultural chemical handling tasks called handling scenarios. From an experimental design standpoint, each scenario is a well-defined population of possible handler-days (H-Ds) and their associated chemical exposures. The goal of every AHETF study is to characterize this conceptual population of exposures using a carefully designed set of synthetic H-Ds called monitoring units

(MUs). Diversity selection methods are used to obtain a set of MUs that adequately spans the space of possible H-Ds for each scenario. Benchmark accuracy objectives for scenario population parameters are established by consensus with regulatory agencies. Monte Carlo simulation methods are then used to find a sample size that efficiently meets the objectives under an analogous random sampling reference model.

AGRO 202
Effect of changes in human exposure regulations on quality assurance audits
***Randy Fuller**, randyfuller@windstream.net, Quality Assurance Consultant, Compliance Assessment/AHETF, Lexington, KY 40509*

With the recent implementation of 40 CFR, Part 26 Protection of Human Subjects, for worker exposure field studies, adaptations by the Quality Assurance Unit need to be implemented to provide appropriate monitoring of Good Laboratory Practices as well as ethical considerations for the workers being monitored. This presentation details the changes that the QAU, along with the Study Director/Managment, must incorporate into the standard auditing program in order to meet the needs of both regulations. As the Quality Assurance Unit for the Agricultural Handler Exposure Task Force (AHETF), Compliance Assessment is in the forefront of developing the appropriate auditing plan in order to provide the highest level of quality and compliance with all Federal Regulations.

AGRO 203
Geospatial risk assessment for agrochemicals: An abridged history
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Geospatial risk assessment and characterization is increasingly common place as part of the agro-chemical registration process world-wide. Increasingly regulators and industry alike use spatial technologies to further refine their risk and ecological assessments. In this presentation a short history of the use of GIS in risk assessment will be offered and set the stage for the “Advancements in Geospatial Risk Assessment and Techniques” symposium. Since Geographic Information Systems (GIS) became commercially available (and more affordable) in the late 1980s, the application of this technology has undergone significant changes. Initially use of GIS was limited to display of the e-fate modeling results in the form of a map, thus showing “spatial variability”. In the mid 1990's many people were working on the coupling of e-fate models with GIS. In this scenario the GIS were often used as a “manager” for simulations, data and output visualizations. In the late 1990' and early 2000's the development of fully integrated GIS risk-assessment and e-fate models took place. In the past years, another interesting dimension was added to the equation-the Internet. Although in the mid 1990's several universities were prototyping the use of the Internet to handle e-fate analysis, the underlying technologies were not available to the larger audience. In today's world, the Internet is playing increasingly a large role in the dissimilation of information and has found its place in stewardship programs.

AGRO 204
Using GIS for spatial modeling in ecological risk assessment of agrochemicals at the catchment-scale in Australia
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Ecological risk assessment is used worldwide in evaluating the acceptability of agrochemicals and to formulate directions of use that follow risk criteria established by regulatory agencies. Several approaches to risk assessment have been developed over the world to regulate agrochemical use and are typically similar to the USEPA framework. This project aims to review the regulatory framework of ecological risk assessment for agrochemicals in Australia and develop spatial modelling procedures to identify sites of significant risk of agrochemical exposure at the “catchment-scale”. Regulatory management of agrochemicals in Australia does not currently distinguish catchments by differing climatic and physical characteristics. Yet it is widely conceded that such attributes are likely to have a significant impact on the factors that influence the fate of agrochemicals, such as drift, runoff, erosion and sorption and ultimately risk to ecological communities. These differences in risk could be considered by developing spatial approaches to characterise exposure and effect. By optimizing transport models, the exposure of agrochemicals in aquatic ecosystems at the catchment-scale may be predicted and subsequently mapped using geographical information systems (GIS). Site-specific endpoints that have spatial ecological relevance can then be determined for freshwater species in streams and rivers, and saltwater species in estuaries, as information on their spatial distribution progresses. It is predicted that the identification of risk ‘hotspots' in a catchment as an output of this analysis will allow managers and farmers to manage risk on farms more efficiently than by reference to nation-wide regulations on chemical use.

AGRO 205
Framework for estimating exposure of ESA-listed salmon to pesticides
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The National Marine Fisheries Service (NMFS) has begun Endangered Species Act (ESA) consultations for the effects of registered uses of pesticides on salmon in streams across the western United States. NMFS has identified that juvenile salmon are most likely to be exposed to harmful pesticide concentrations in shallow off-channel habitats, but they acknowledge that the frequency of fish intersecting these concentrations is unknown. We demonstrate an analytical framework that employs available data to predict the probability of juvenile salmon exposure to pesticides. The framework incorporates data on the distribution of salmon rearing in streams, the preferences of juvenile salmon for specific types of habitat, the availability of those habitat types as determined from stream habitat surveys, and the timing of juvenile salmon presence in different portions of

stream networks. The availability of stream habitat features in a watershed can be mapped from existing stream surveys or predicted based on topographic and geographic features of the watershed. Information on topography and land uses can be used to predict zones of overlap between possible pesticide presence and fish use. We aligned the data sets on probable fish density distribution in time and space with the probable geographic and temporal distribution of pesticide in order to estimate fish exposure to the pesticide. These methods can be extended to stream networks and all ESA-listed salmonids throughout the Pacific region.

AGRO 206

Development of spatially explicit model inputs for evaluating ecological impacts to streams in Ohio

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Water quality is subject to a variety of pressures including changes in physical habitat, point-source discharges, water abstraction, nutrients and trace organics from domestic, rural and industrial sources. These stressors impact on and alter ecosystems. Each stressor will contribute to the overall net ecological impact, although the significance of each individual pressure will vary between locations. Previous work included the application of several models to quantify the local impact and relative contribution of each stressor class to fish and macroinvertebrate communities in Ohio. This research has been enhanced to develop refined model inputs based on spatial analysis of various stressors. This presentation describes the source of stressor data, how they were examined and quantified in a spatial manner, and how they will be implemented into existing models. Stressor information was calculated for individual catchments within the NHDPlus dataset, and aggregated to upstream drainage areas for over 3,000 biological monitoring locations.

AGRO 207

National scale modeling framework design for probabilistic agrichemical risk assessment

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National scale multi-year simulation modeling has many challenges, particularly when working with highly detailed national databases for soil (SSURGO), cropping and alternative land-use simulation, multi-year simulation scenarios, and millions of small catchments representing the CONtinental United States (CONUS). The authors have developed operational methods harnessing parallelism for executable processing, customized results processing algorithms, and developed enterprise-level SQL database transactions to process data at many scales. In addition, although simulations are run discretely at the CONUS level, methods have been developed to automate aggregation of results processing at any number of catchment scales. Results are processed for all dissolved and adsorbed chemical fluxes, runoff volume, sediment yield, and field-scale runoff and leaching concentrations in the context of probabilistic yearly estimates over 30 years with the potential for daily-level data mining still being explored.

AGRO 208

Outlook on EU guidance on emissions of plant protection products (PPP) to air

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Risk assessment of PPPs is requested in the EU when scientific methods, accepted by EFSA for assessing the effects on organisms, are available according to EU directive 91/414/EEC and the EU regulation replacing this directive. Due to lack of guidance, Forum for Co-ordination of pesticide fate models and their Use (FOCUS) decided to develop recommendations on how to estimate PECs in air. EFSA PPR produced a scientific opinion on the FOCUS air report. The EFSA opinion proposed including additional guidance on methods of application, refinements of exposure assessment and uncertainty analysis. New EU guidance on emissions of PPP on protected crop systems (greenhouses and covered crops) to the environment, including air, has been initiated by EFSA due to a gap in the exposure assessment methodology. The new EU guidance will contain an inventory of protected crop systems as well as estimating and ranking potential emissions from these systems to environmental compartments including air. To get input from stakeholders, a public consultation was held in 2008. The new guidance document is expected to be finalised in 2010. Further information can be found on the web-sites of EFSA PPR Panel, EFSA closed consultation and FOCUS Home.

AGRO 209

Computational fluid dynamics investigation of methods to measure emissions from natural ventilated livestock buildings

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Natural ventilated buildings are widely utilized in livestock husbandry, and especially in cattle production it is common to use buildings with very large ventilation openings. These large opening makes it challenging to determine the emission of contaminant gases, including ammonia and methane, from the buildings. The challenge is mainly caused by the large variations of gas concentration and air velocity at the openings. Different methods – typically based on mass balances - have been applied. But efficient ways to validate these methods is not yet found. Opposite to measurements, computational fluid dynamics (CFD)methods contains a complete description of all relevant properties in the entire investigated air volume, and, therefore CFD results includes all the data necessary to determine the exact emissions of gases. Consequently, a suggested measuring method can be transferred to CFD and validated against exact values. Based on field experience data, this work investigates possibilities to apply CFD to validate and optimize measuring procedures for gas emission from natural ventilated livestock buildings.

AGRO 210
Monthly, seasonal. and annual ammonia emissions from southern High Plains cattle feedyards
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Ammonia emitted from beef cattle feedyards adds excess reactive nitrogen to the environment, and contributes to degraded air quality as a precursor to secondary particulate matter. Accurate ammonia emissions are required because, beginning in 2009, most feedyards are required by the Emergency Planning and Community Right-to-know Act to report their ammonia emissions. Atmospheric ammonia concentration and meteorological variables, continuously measured for two years, were coupled with an inverse dispersion model to estimate ammonia emissions from two cattle feedyards on the southern High Plains. Additional data on feedyard cattle populations, feed intake, and feed nitrogen content were collected from records supplied by the feedyards and from analyzed feed samples. Mean monthly, seasonal and annual per capita ammonia emissions are reported. Annually, from 36% to 56% of fed nitrogen was lost as ammonia. Management differences at the two feedyards contributed to differing ammonia emissions, with nitrogen content of feed a strong determinant of emissions.

AGRO 211
Model assessment of fumigant emissions
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Simulation models have long been recognized as useful for estimating the environmental fate and transport of pesticides. Soil fumigants such as methyl bromide are a special group of pesticides with high vapor pressure values. A main concern with fumigants is the large potential for atmospheric emissions. Because of the large emissions and ozone depleting property with bromine, methyl bromide was phased out for soil fumigation use. As a result, a significant amount of research has been carried out on the efficacy and environmental fate and transport of methyl bromide alternatives. This presentation will review modeling activities related to soil fumigant emissions with a special focus on simulating fumigant emission fluxes. A general overview of fundamental physical and chemical principles for modeling the environmental fate and transport of soil fumigants will be provided. Discussions will be made on future needs in modeling fumigant emissions.

AGRO 212
Review of design issues for on-field flux assessment methods
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The collection of field data to estimate airborne fluxes from agricultural fumigants is costly. There is a strong incentive, therefore, to improve the efficiency of data collection and the extrapolation of the results to broader settings through subsequent soil modeling. This paper identifies design considerations that can reduce the cost of data collection and improve the ability to extrapolate the results to a broader range of soil types and soil conditions. On-field concentration and wind profile data are commonly collected to estimate flux rates, with interpolation based on the following methods: Integrated Horizontal Flux method (IHF), Aerodynamic method (AD), and the Theoretical Profile Shape method (TPS). The focus of this paper is on the IHF method because of the benefits of smaller treatment plot sizes relative to the AD method, and the complications associated with seeking circular treatment plots for the direct use of the TPS method in agricultural settings. The design considerations of principal importance include: (1) the number and heights of selected monitoring levels for concentration and wind data, (2) field size / fetch considerations, (3) the characterization of uncertainty associated with each time step, (4) supplementary data collection needed to support subsequent soil-based emission scalars for different soil types and soil conditions, (5) methods to accommodate multiple field trials on a concurrent basis, which is highly dependent on the number of levels monitored at each treatment, (6) supplementary meteorological data to support future data interpretation, and (7) supplementary odor monitoring to complement the collection of air concentration data. Each of these issues is demonstrated based on normalized examples from recent field studies.

AGRO 213
Modeling approaches for quantifying emissions from commodity treatments
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In an effort to develop more refined approaches for evaluating exposures associated with the use of fumigants to treat stored commodities and structures, the U.S. EPA developed approaches for considering this highly diverse industry. Several factors, including building or chamber design, treated volumes, sealing methods, changing weather conditions, absorptive properties of treated commodities, and aeration techniques were examined. Other specific factors of recent interest include the placement and sizes of stacks, use of an exponential approach for modeling dilution, consideration of multiple aeration points, and the influence of site specific weather conditions. A summary of the methods used to quantify emissions will be presented.

AGRO 214
Direct measurements of the ozone formation potential from agricultural animal source emissions using a transportable smog chamber
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California's San Joaquin Valley (SJV) has one of the most severe ozone non-attainment problems in the United States. California has new air quality rules addressing the agricultural sources of ozone precursors in this region, including dairy farms, swine facilities, beef cattle operations, and poultry farms. Official inventories produced by the California Air Resources Board (CARB) predict that animal sources, mainly dairy cattle, are second only to on-road vehicles as a leading source of ozone precursor emissions in the SJV. The assumptions used to reach this conclusion are based on outdated and/or incomplete measurements. In the current study, a transportable “smog” chamber was constructed to directly measure the ozone formation potential of agricultural sources with emphasis on the four leading livestock sources identified by CARB. These direct measurements show that the ozone formation potential from

animal sources is much lower than current estimates used in the official inventories.

AGRO 215

Determination of VOC emissions and ozone formation from spraying solvent-based pesticides in the San Joaquin Valley of California

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Large scale agricultural activities have come under scrutiny as a secondary source for their contribution to the emission of ozone precursors. An area with intense agricultural operation, the San Joaquin Valley of California suffers high ozone formation for more than 30-40 days/year according to the federal health based standard and for more than 100 days/year as per state standards. Pesticides are used widely in agricultural operation however; homeowners, industry and others may also have some use. Organic compounds emission from pesticide use arises because of the volatile nature of many active ingredients, solvents, and other additives used in formulations. Emissions can result directly during application or as the active ingredients or solvent volatilizes over time from soil and vegetation. The present study was aimed to determine the role of pesticide formulation spray on VOCs levels and ozone formation effecting air quality. The ozone formation potential from the pesticide formulation spray on the orchard was studied using two transportable smog chambers at each application site. Since VOCs are the main precursors in ozone formation, we also measured air and soil samples to assess VOCs levels before and after spraying. We are reporting here the results of 4 field applications of solvent-based pesticides in the San Joaquin Valley during the summers of 2007 and 2008. Canister grab samples, adsorbent tube time integrated samples and DNPH tube samples for carbonyl compounds were collected for VOCs measurement in air. Soil samples were also collected and analysed. A number of VOCs were found in the air and soil samples throughout the experiment while higher molecular weight aromatic hydrocarbons were usually observed in elevated concentration immediately after spray. Experimental findings indicated that the VOC emission and ozone formation potential tends to increase in the air after pesticide application.

AGRO 216

Low volatility solvents and oil pesticides and their ozone formation potential

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Ground-level ozone is one of the most important pollutants that have significant effect on the air quality of the United States. Some areas like San Joaquin Valley (SJV) and South Coast Basin of California are severely affected by high ozone levels. Ozone is of great concern because it is harmful to our health as well as to the environment. Ozone is formed by chemical reactions between volatile organic compounds (VOCs) and nitrogen oxides (NOx) in the presence of sunlight. While vehicular emissions are one of the major sources of VOCs and NOx in California, much work has already been done on their contribution to ozone formation. Lately other VOC sources such as pesticides have become a top priority for California especially in the SJV,because of its heavy use in Agricultural activities. Many urban and urban-influenced regions around the entire United States experience ozone levels over the regulated standards, in part due to the aforementioned sources. The actual contribution to ozone formation from pesticide applications as well as other agricultural sources is largely unknown. Little or no research has been conducted in the past on low volatility solvents, oil pesticides and their ozone formation potential (OFP). The purpose of this project is to quantify the OFP of low volatility solvents and oil pesticides. The assessment experiment is carried out using a reactivity chamber simulating the summer time conditions of the SJV, with both field and laboratory experiments. Ozone formation as well as NOx concentration profiles were measured directly using a Photometric ozone analyzer and a NOx Chemiluminescence analyzer. Our preliminary results have shown that the OFP of low volatility solvents and oil pesticides is relatively low.

AGRO 217

Effect of meteorology and soil condition on metolachlor and atrazine volatilization

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A 10-year study was conducted to focus on the impact of soil and climatic factors governing herbicide volatilization from an agricultural field. For the first 5 years, metolachlor [2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl) acetamide] and atrazine [6-chloro-N-ethyl-N'-(1-methylethl)-1,3,5-triazine-2,4-diamine] concentration profiles were continuously monitored for the first 5 days after application. For the second 5-year period, herbicide concentration profiles were monitored at two locations in the same field where only the surface soil water contents differed in response to the presence and activity of subsurface flow pathways. A flux gradient technique was used to compute volatilization fluxes from herbicide concentration profiles and turbulent fluxes of heat and water vapor as determined from eddy covariance measurements. Differences in meteorological and surface soil water contents resulted in variability of volatilization losses among years. When soil surface conditions approached saturation 62.2% of the applied metolachlor was lost to volatilization compared to 11.8 % of the atrazine. Detailed soil moisture observations in the second 5-year period showed that surface soil water contents and surface meteorological conditions are critical factors governing herbicide volatilization losses. For example, during 2004 and 2005 surface soil water contents at the “dry” location were nearly half those at the “wet” location. Meanwhile, cumulative metolachlor vapor fluxes during 2004 and 2005 at the dry location were also about half that of the wetter location. However, when drought conditions render the subsurface flow pathways inactive the surface soil water contents and herbicide vapor losses at the two locations were nearly identical. Additionally, analysis of infrared soil surface temperatures shows a correlation between surface soil temperatures and metolachlor volatilization when soils are wet but not when the soils were dry. This research demonstrates that to eventually predict pesticide volatilization both surface soil water content and surface meteorological conditions must be understood and quantified.

AGRO 218
Foliar fungicide occurrence in urban and agricultural streams
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Foliar fungicides are applied to foliage in urban and agricultural landscapes to kill or inhibit the growth of fungi on plants. The U.S. Geological Survey completed a study from May through September 2008 to determine the occurrence of fungicides in surface water samples from six streams in eastern Nebraska. The samples collected during this study were analyzed for the fungicides azoxystrobin, boscalid, chlorothalonil, cyproconazole, metconazole, myclobutanil, cis-propiconazole, trans-propiconazole, pyraclostrobin, tebuconazole, tetraconazole, and trifloxystrobin. This presentation will compare fungicide occurrence in a stream draining a mixed urban/agricultural watershed to occurrence in streams draining agricultural watersheds within the study area. Results indicate that more types of fungicides were detected in the mixed urban/agricultural stream than in the agricultural stream, and that timing of fungicide occurrence in the stream was also different in the urban watershed compared to the agricultural watersheds.

AGRO 219
Golf turf pesticide runoff losses from four regional sites
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Efforts to validate runoff models for use on turf have been hampered by the availability of comprehensive regional data sets that can be used to demonstrate the wide spread applicability of the model validation effort. A multi state collaborative project was initiated to generate regional data sets that could be used to overcome this limitation. A common research protocol was used to evaluate pesticide runoff from fairway managed golf turf plots located in Mississippi, Maryland, Minnesota and Oklahoma. The runoff of 2,4-D, flutolanil and chlorpyrifos was examined at the four sites under realistic worst-case soil moisture and simulation rainfall conditions. No one site was identified has having consistently different pesticide concentrations than any other site for all three of the pesticides that were examined. When losses were normalized to runoff amount and expressed as a percent of the amount of pesticide applied chlorpyrifos and 2,4-D runoff losses were site dependent while flutolanil losses were invariant of site location. Our results suggest that runoff losses of high-load rate pesticides applied turf may be less sensitive to site conditions than are low-load rate pesticides. The results also emphasize the need to examine several pesticides when evaluating the ability of a model accurately assess pesticide runoff from turf.

AGRO 220
Reducing the environmental impact of urban runoff: Use of management practices to mitigate pesticide and nutrient transport with runoff from fairway turf
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The detection of pesticides and excess nutrients in surface waters of urban watersheds has lead to increased environmental concern and suspect of contaminant contributions from residential, urban, and recreational sources. An estimated 25% of pesticides used in the United States result from nonagricultural pest control. Highly managed biotic systems such as golf courses and commercial landscapes often require multiple applications of pesticides and fertilizers that may be transported with runoff to surrounding surface waters. Experiments were designed to measure the quantity of pesticides and nutrients transported with runoff from turf plots maintained as a golf course fairway, and to evaluate the ability of management practices to reduce chemical transport with runoff. Plots were managed with either solid tine aerification, hollow tine aerification, or hollow tine aerification with verticutting (vertical mowing). Quantification of runoff volumes and chemical concentrations revealed reductions in chemical loads from plots managed with hollow tine aerification or hollow tine aerification and verticutting. Measured edge-of-plot loads were used to calculate estimated environmental concentrations of pesticides and nutrients in surface waters receiving runoff. A comparison of water quality standards and toxicological endpoints with measured edge-of-plot runoff and estimated surface water concentrations demonstrate implementation of management practices can mitigate ecological risks of pesticides and nutrients transported with runoff from managed turf

AGRO 221
Use of a storm water management model for diagnosis of residential exposure issues
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Many products are available for use by homeowners to protect and beautify their lawn and gardens. However, careless use or misunderstanding the intended use can sometimes lead to unintentional contamination of waters leaving residential areas. Finding the causes of unintentional exposures can often be difficult to determine, and therefore hampers stewardship efforts. We use an urban/suburban storm water model (SWMM) in an effort to discover which conditions most likely contribute to chemical micro constituents being found in storm drain water samples. The test case for the work is based on neighborhoods found in Southern California. Results from this work indicate that use of a model such as SWMM can be helpful as a diagnostic tool for determining exposure contributors in residential areas.

AGRO 222
Urban BMPs can protect water quality: Non-pesticides as models for pesticides
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Residential/urban developments are typically designed and built with BMP features. Examples are detention basins, sand filters, wetlands, porous pavers, infiltration basins, and wet ponds. This practice has been standard operating procedure in most counties in the US for several decades. One

objective of these BMPs is the control of peak storm flow to control erosion. Of greater interest for this symposium is the other key objective, the protection of water quality. Civil engineers and urban planners are familiar with this standard of care for urban environments, but pesticide scientists and regulators are generally not. Many studies have been done on contaminant attenuation by urban BMPs. For example, the International Stormwater BMP Database contains data from over 300 studies. Most analytes in BMP studies are not pesticides, e.g., TSS, nitrate, lead, and P. However, this extensive amount of data could be used to guide risk assessment and risk reduction discussions and investigations for urban pesticides.

AGRO 223
Organic wastewater compounds in combined sewer overflows, stormwater, and receiving streams in Omaha, Nebraska
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Combined sewer overflow (CSO) is the discharge of a combination of rainfall runoff (stormwater) and sanitary wastewater as a result of sewer capacity being exceeded during heavy storms. When the stormwater and sanitary wastewater exceed the CSO system's capacity, sewage is forced to overflow into streams through CSO outfalls. The U.S. Geological Survey, in cooperation with the City of Omaha, has conducted a CSO monitoring project to assess the water-quality impacts of CSOs on the Missouri River and other receiving streams in Omaha, Nebraska. During the study, water-quality samples were collected at 15 stream sites, 11 CSO sites, and 2 stormwater sites. Two sets of water-quality samples were collected monthly: one set on a scheduled date (at stream locations), and one set during storm-induced CSO events (at stream, CSO, and stormwater locations). Organic wastewater compounds that were analyzed included flame retardants, detergent metabolites, steroid compounds, fragrances, and pesticides. Results indicate increased loads of organic wastewater compounds from both CSOs and stormwater are affecting the water quality of receiving streams in this area.

AGRO 224
Refinements of AHETF study design criteria and volunteer recruitment procedures utilized by AHETF for populating a generic handler exposure database pursuant to HSRB reviews
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The Agricultural Handler Exposure Task Force (AHETF) is populating a generic handler exposure database to be used by NAFTA regulatory authorities for occupational exposure risk assessments. In response to ethical and scientific reviews by EPA's Human Studies Review Board (HSRB), AHETF has modified the study design requirements for generating data for handler exposure scenarios. AHETF has modified the procedures to obtain and summarize agricultural expert opinion for the handling scenario being studied. Thorough justification for the geographic distribution of crops and equipment used to study a specific handler scenario is required to support sample diversity. Sampling procedures for recruiting growers, contract spray organizations, and study participants were implemented. Specific precautions were implemented for recruitment of employees to address concerns of undue influence by the employer. AHETF also modified the informed consent process and materials distributed to address HSRB concerns.

AGRO 225
Design of an observational worker exposure study in commercial seed treatment facilities
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To support seed treatment products manufactured by Bayer CropScience (BCS), an observational study consistent with the Protections for Subjects in Human Research Rule was performed to determine the potential exposure for workers involved in various work functions associated with operating commercial seed treatment systems. Workers at two canola treating facilities in Canada and three corn treating facilities in the United States were monitored during treating, bagging/sewing/stacking, and cleanout activities to determine the nature and amount of exposure to seed treatment chemicals during their normal work activities. This presentation will describe the general experimental design and the processes used to identify and select the seed treatment facilities and volunteers used in the study.

AGRO 226
Transfer of flea control insecticides in collars or spot-on treatments from pet dogs to people
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Insecticides in over-the-counter treatments for fleas and ticks on pet dogs are a potential source of exposure to people. Residues of the organophosphates chlorpyrifos and tetrachlorvinphos in two collars and the pyrethroid permethrin in a spot-on were quantified on gloves used to rub the fur at intervals after product application. Metabolites of these insecticides were studied in the urine of children and adults in the household of the dog. While residues of chlorpyrifos and its metabolite in urine were only slightly, if at all, above baseline levels, residues of tetrachlorvinphos and its metabolite were substantially higher. These differences between the two organophosphates may reflect differences in the physicochemical characteristics of the compounds or in the formulation matrix. While permethrin residues on glove dosimeters were substantially above baseline, urinary metabolite levels were only slightly above baseline. Urinary metabolites in children were generally greater than in adults. (Supported by EPA STAR Grant R828017)

AGRO 227
Updating standard operating procedures for residential exposure assessment
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In the effort to develop more refined approaches for evaluating risks associated with residential uses of pesticides, the U.S. EPA is currently developing updates to its Standard Operating Procedures For Residential Exposure Assessment (SOPs). The SOPs were first developed in response to the Food Quality Protection Act (FQPA) and used during the assessments completed in response to FQPA. Recently additional pertinent data have become available that provide the opportunity to refine various elements of the methods and actual input values used in the SOPs. Additionally, the use of probabilistic modeling approaches have become more common and the revised SOPs will place much more emphasis defining appropriate inputs for use of

these methods. An overview of the ongoing revisions will be presented.

AGRO 228

Efforts toward the development of risk assessment guidelines for use by regulatory agencies in Brazil

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Until recently crop protection products in Brazil have not been assessed according to risk based criteria (risk is a function of hazard and exposure), but rather have focused on hazard alone. Decree no. 4074/2002, article 95th, inc. III – requires the Pesticide Technical Committee (CTA) to determine the rules to implement pesticide risk assessment. Efforts are currently being undertaken by Brazilian industry to promote a risk-based assessment approach using generic mixer, loader and applicator exposure data from the U.S. EPA Pesticide Handlers Exposure Database (PHED), in conjunction with product-specific hazard data, for handler scenarios relevant to Brazilian agriculture. Efforts are also underway to form a New Entity to develop generic exposure data to address Brazilian specific use patterns in cases where the data in PHED are not adequate or appropriate.

AGRO 229

Atrazine ecological exposure monitoring program: Study design and conduct

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An Atrazine Ecological Exposure Monitoring Program (AEMP) was initiated in 2003 and continues in 2009. Monitoring in 45 corn and sorghum agricultural watersheds in nine Midwestern states produced 97 “site years” of land use, residue, total suspended solids, meteorological, and stream flow data. Sampling locations were identified on streams at the outlets of watersheds based on defined criteria for potential atrazine use and watershed scale. Watershed sampling locations were equipped with an integrated system of weather stations, automatic samplers, and stream stage measurement stations. Monitoring in each watershed was designed to collect four-day grab samples during the five month growing season. Runoff event based and daily automatic sample collection programs were used during the study. Land use was characterized by customized satellite image classification or USDA NASS Cropland Data Layer data. Results show that the AEMP study design adequately captured atrazine runoff events following chemical applications for each growing season.

AGRO 230

Modeling community-level responses to atrazine in Midwestern streams

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The “Comprehensive Aquatic Systems Model for Atrazine” (CASM_Atrazine) was developed to simulate ecological production dynamics of a typical 2nd-to-3rd-order Midwestern stream with or without atrazine exposure. CASM_Atrazine simulates daily biomass production of modeled aquatic producer (periphyton and macrophytes) and consumer (bacteria, zooplankton, benthic invertebrates, and fish) populations as nonlinear functions of fluctuating environmental conditions, food-web-related interactions, and species-specific sensitivities to atrazine exposure. The purpose of CASM_Atrazine is to simulate the potential for realistic, time-varying atrazine concentrations to influence community biomass and structure over a one-year period. First, a baseline (no atrazine) stream simulation was developed to model seasonal patterns and magnitudes of producer and consumer community biomass production characteristic of Midwestern streams. Second, model performance was evaluated through validation with reference field data and atrazine-specific micro- and mesocosm studies. The results suggest that CASM_Atrazine is useful for assessing potential community-level effects from time-varying atrazine exposures representative of Midwestern lotic ecosystems.

AGRO 231

Identifying watersheds that potentially exceed effects-based atrazine thresholds from a multiyear monitoring study

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As one of the conditions for re-registration of the herbicide atrazine under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), EPA required atrazine registrants, in consultation with the Agency, to develop a monitoring program to determine the extent to which atrazine concentrations associated with corn and sorghum production may be exceeding levels that could cause effects to aquatic communities. The monitoring study sampled 40 sites representing high atrazine use and conditions vulnerable to atrazine runoff over a multiyear period. In its evaluation of the study, EPA (1) assessed the extent to which the monitoring sites exceeded aquatic community levels of concern (LOC), (2) identified soil, hydrologic, weather, and use characteristics that distinguished watersheds that exceeded the LOC from those that did not, and (3) identified additional areas outside of the original monitoring sites that may potentially exceed effects-based atazine LOCs based on similar watershed characteristics.

AGRO 232
Agrochemical surface water monitoring: Interpreting results from the atrazine ecological exposure monitoring study
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In 2003, EPA requested a study to monitor small watershed streams to understand the magnitude and duration of potential Atrazine exposures. This extensive multi-site study has now successfully generated over 95 site years of high frequency Atrazine monitoring data constituting an unique dataset for small Midwest agricultural streams which shows show that, of the original 40 subwatersheds, 35 did not approach the conservative level of concern (LOC). Three subwatersheds in south eastern Nebraska experienced higher residues matched with periods of dryness precluding full analysis against the LOC. Two subwatersheds located in north eastern Missouri characterized by continuous very shallow restrictive layers on sloping cropped land experienced LOC exceedances. Detailed spatial analyses have shown that these watershed characteristics co-occur infrequently across the Midwest. The study results and other available atrazine surface water data have been compared with output from high spatial resolution PRZM modeling in order to extrapolate study findings to over 35,000 watersheds similar in size to those monitored in the study.

AGRO 233
Hybrid PRZM: Combining high frequency field sampling data and simulation modeling
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The Hybrid-PRZM approach combines observations from field monitoring with uncalibrated results from simulation modeling over the same period of record. The approach uses Pesticide Root Zone Model (PRZM) simulations based on the locally measured rainfall for each season together with site-specific watershed soil and agronomic characteristics. The model is used to estimate edge-of-field atrazine concentrations occurring on days with rainfall and the simulation results are scaled to watershed conditions without calibration. The PRZM model results supplement the 4-day field monitoring results and provides a conservative view of potential residues. This technique captures the strengths of field and simulation results to present a conservative daily time series using quality sampling results, appropriate simulation assumptions, and a set of simple rules designed to provide the optimum result on any given day within the period of interest.

AGRO 234
Determining the depth to a restrictive or claypan layer: National assessment at the field scale
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The Atrazine Ecological Monitoring Project (AEMP) identified a small cluster of watersheds having extended-duration concentrations of atrazine in Northeastern Missouri identified as the Missouri zone of the Central Claypan Major Land Resource Area. A search of the literature indicated that a number of studies focusing on erosion and surface water quality have indicated that the area is highly sensitive to the rainfall-runoff process. A few field-scale publications indicated that the presence of a shallow claypan layer can cause rapid shallow interflow like processes. By re-examining these experimental results at the watershed level, a hypothesis was developed that the landscape-dominant presence of soils with shallow/restrictive claypan layers within a watershed is critical in identifying and ranking those watersheds sensitive to the rainfall-runoff process. Evaluation of the hypothesis, processing of results on a national scale, and ranking of watershed sensitivities will be presented.

AGRO 235
National SSURGO based PRZM modeling: Comparative exposure potential
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A probabilistic modeling framework was developed based on PRZM (Pesticide Root Zone Model). Simulations were parameterized to represent atrazine environmental fate scenarios for soils based on the available SSURGO (Soil SURvey GeOgraphic) soils database at the CONUS (COntinental National United States) level. Currently, the publicly available SSURGO database is built at the unit level (county level or similar sized) and is still in the process of being completed by the NRCS (Natural Resources Conservation Service). The simulation runs were configured using the SAMSON meteorology dataset, SSURGO county databases, atrazine chemical characteristics, and cropping parameters representing conventional corn/sorghum cropping across the CONUS region. Simulation results were then adjusted using estimates of corn/sorghum derived from remotely sensed data and proprietarily available atrazine usage. Results are presented in a probabilistic framework and were used to rank watershed sensitivity to atrazine losses to surface water across the US.

AGRO 236
Visualization challenges in high resolution spatial assessments
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The explosion of available, highly-detailed spatial data has allowed for unprecedented detail in examining environmental factors in fate and transport. Detailed data such as SSURGO,

NHDPlus and DEMs, as well as tools such as Google Earth® and Microsoft Virtual Earth™ give users the power, and perhaps the expectation, of high resolution spatial analyses. Yet, when tasked with presenting results of such detailed studies which may span states or the entire US, the author is hard pressed to find not only a method to communicate his/her point, but also one which is accurate and minimally influenced by the data restructuring required to put a national map onto a computer display or a printout. Issues and caveats for presenting such data will be discussed, along with approaches to effectively visualize detailed studies over a large area.

AGRO 237
Ammonia volatilization from broiler litter
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The objectives of this study were to: (1) measure ammonia emissions from litter in broiler houses, during storage and following land application, and (2) conduct a mass balance of nitrogen (N) in poultry houses. Ammonia concentrations and ventilation rates were recorded continuously from four broiler houses for one year. Nitrogen inputs (feed, chicks, and bedding) and outputs (live birds, mortality, litter/cake, ammonia emissions, and nitrous oxide emissions) were also quantified. In-house ammonia emissions were 37.4 g ammonia/bird (50 day old birds). The N mass balance study recovery was 98.6%. Nitrogen inputs from bedding, chicks, and feed were equivalent to 0.60, 1.19, and 139.56 g N/bird. Nitrogen outputs from birds marketed, ammonia emissions, litter/cake, mortality and nitrous oxide emissions were equivalent to 78.2, 30.8, 28.7, 1.3, and 0.5 g N/bird. Ammonia losses from litter broadcast to pastures were equivalent to 7.91 g ammonia/bird. The total ammonia emission factor for broilers measured in this study, which includes losses in-house, during storage, and following land application was 45.5 g ammonia/bird marketed.

AGRO 238
Effect of dietary methionine and benzoic acid on emission of volatile sulphur compounds, ammonia, and methane from stored pig slurry
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Supplementation of benzoic acid to diets of pigs is efficient in reducing pH of urine and thereby the emissions of ammonia from slurry, but may also effect other gas emissions. Furthermore sulphur containing compounds are expected to play an important role in odour emission. In this study, we investigated the emissions of hydrogen sulphide, methanethiol, dimethyl sulphide, dimethyl disulphide and dimethyl trisulphide as well as ammonium and methane from stored slurry from a feed experiment with four pig diets in a factorial design with 2% benzoic acid 1% DL-methionine as treatments. In slurry with the control diet optimised according to current Danish recommendations, all sulphur gasses were identified. Benzoic acid reduced the slurry pH and ammonia emissions and in the early phase of storage also methane emissions. Sulphur gas emissions were influenced by a strong interaction between methionine and benzoic acid treatments.

AGRO 239
Effects of chemical treatment of slurry with ozone and sulfuric acid on gas emission from fattening units
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Slurry from a fattening unit was treatment with ozone and sulfuric acid followed by re-flushing of the treated slurry into the slurry containers. Before the chemical treatment the manure was separated mechanically so only the liquid fraction was treated. The process was repeated once weekly for two batches of finishers. Experiments were carried out as case-control studies in small experimental units containing 32 finishers with online monitoring of ventilation, ammonia concentration, carbon dioxide concentration, and temperature. At least 20 odor-measurements by olfactometry per batch were carried out. Addition of sulfuric acid to the mechanically separated and ozone treated slurry before re-flushing, reduced the emission of ammonia with approximately 60 % immediately after treatment. However the effect of acidification decreased as the finishers continuously delivered new material to the slurry. Emission of odor was nearly halved, similar to what have been observed with ozone treatment alone.

AGRO 240
Factors which influence emissions of soil fumigants
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In the effort to develop more refined approaches for evaluating exposures associated with the pre-plant soil uses of several fumigants, the U.S. EPA investigated factors thought to influence emissions using laboratory and field scale data. The results indicate that several factors can be manipulated to reduce emissions. These include the use of high barrier agricultural films (e.g., Virtually Impermeable Films), the use of reactive boundary layers (e.g., sodium thiosulfate), and manipulation of soil moisture and bed compaction where feasible. Other factors include application equipment design and the inherent conditions of a treated field which may not be as easy to manipulate (e.g., soil type and organic matter levels). A summary of this analysis will be presented.

AGRO 241
Plastic films for soil fumigation: Permeability and emissions reduction
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Soil fumigation is being increasingly regulated to protect human and environmental health. Current California regulations are based on field data and, in effect, assume that use of a standard polyethylene tarp does not reliably reduce emissions. Plastic tarps used to cover the soil surface during soil fumigation vary in their effectiveness as diffusion barriers. A robust method to measure the permeability of plastic films is needed to develop management practices that consistently restrict fumigant emissions and improved

policies regulating soil fumigation. We propose a simplified method to quantify film permeability using the mass transfer coefficient, which is a characteristic of a film-fumigant combination independent of the concentration gradient across the film. We will summarize a number of laboratory experiments to determine the mass transfer coefficients of polyethylene and low-permeability films to fumigant vapors and field studies to determine the effectiveness of plastic films in reducing atmospheric emissions of fumigants.

AGRO 242
Increasing efficacy and decreasing the application rate of Telone C35 with carbon dioxide
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This research aims to increase the efficacy of the alternative fumigant, Telone C35, such that lower soil application rates are feasible. Greater efficacy can be achieved by increasing the soil fumigant's apparent vapor pressure; thereby, dispersing the gases throughout more subsurface soil volume with toxic concentrations in less time. Telone C35 (1,3-dichloropropene plus 35% chloropicrin) that is propelled by carbonation, rather than N_2, should exhibit enhanced efficacy. Carbonation can be accomplished by pressurizing Telone C35 with CO_2 before soil injection. Upon release of pressure at injection, the degassing CO_2 would sweep the active ingredients from solution into the vapor phase. This should create a much larger “killing zone” in a shorter time than usually exhibited by these fumigants. The use of CO_2 with Telone C35 has been shown to allow quicker and deeper distribution of Telone C35 compared to dispensation by N_2 at similar or higher application rates.

AGRO 243
Development of practices for minimizing emissions from soil fumigation using field plot tests
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Reducing emissions is essential for minimizing the potentially negative impact of soil fumigation on air quality. To develop practices for minimizing emissions, studies were conducted using field plot tests. Fumigant emissions were measured using either static (passive) or dynamic (active) flux chambers. Dynamic flux chamber systems (DFCs) allow continuous and auto-sampling of emission flux changes and cumulative emission losses over time. Compared to large field-scale emission trials, which require on- or off-site monitoring and computer modeling to estimate emissions, flux chamber methods measure emissions directly from the soil surface and have the advantage of reducing labor requirements and providing replicate data for individual treatments. When used in conjunction with laboratory column studies, the field data were helpful in determining the effectiveness of various surface sealing techniques and treatments on emission reductions under field conditions. These surface treatments included plastic tarping, irrigation and surface soil amendment (e.g., with organic materials).

AGRO 244
Emissions of 1,3-D and chloropicrin from a single soil under a range of application and emission reduction strategies
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From a single sandy loam soil (Buttonwillow, CA) the soil-to-air emissions of the agricultural fumigants 1,3-dichloropropene and chloropicrin have been quantified for both shank and drip applications, and for a wide range of emission reduction strategies, e.g organic matter addition, surface irrigation, plastic tarps (HDPE, VIF), ammonium thiosulfate addition (spray and irrigation) and deep injection. Comparison to control conditions demonstrates the relative effectives of these approaches in reducing the emissions of these fumigants and, hence, their impact on air quality. Although, in general, laboratory approaches have been used in these studies, in several cases field and modeling studies have also been adopted; allowing for a comparison of these three approaches in terms of emission estimates. The potential effectiveness of laboratory and modeling approaches in first simulating field-based data, and then readily extending the range of emission reduction strategies that can be assessed, will be discussed.

AGRO 245
US catfish industry: From pond to plate
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Commercial culture of catfish in the US dates back to the late 1960's. By 2003, the industry peaked at 662 million processed pounds and has been contracting since as it contends with foreign imports and adverse feed and fuel prices. Strengths of the industry have been the production of a healthy product using environmentally sound practices. The industry adds significantly to rural agricultural economies of the Southeast. Challenges facing the industry include improving production efficiencies to lower production costs and improving product consistency regarding flavor and appearance. A new integrated approach aimed at solving these challenges has begun in Alabama. The “Pond to Plate Project” is a public and private sector partnership whose multi-year objectives are to identify and improve critical points for catfish production, harvesting, hauling, processing, distribution, and marketing to improve efficiencies and insure a consistently, high quality product to consumers.

AGRO 246
Environmental sustainability of channel catfish aquaculture
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Global and domestic aquaculture production has expanded rapidly in the last 30 years to meet the ever-increasing deficit between global seafood demand and the static catch from capture fisheries. Concurrent with its rapid expansion, environmentalists have criticized aquaculture as a wasteful use of resources and for causing negative environmental impacts. This criticism is often broadly applied, not recognizing that aquaculture is an extremely diverse

endeavor with a large range of potential impacts. Environmental impacts of aquaculture depend on the species under culture, the type of culture system, and the location of the farming activity. Overall, channel catfish farming in the southeastern United States is one of the most environmentally benign forms of aquaculture practiced at commercial scale. Channel catfish are native to the southeastern United States and pose little threat to local fisheries if they escape. Catfish are also omnivores and have no requirement for fishmeal in their diets. As such, production of catfish greatly adds to, rather than reduces, net global seafood production. Modern catfish farming relies on manufactured feeds to support fast fish growth, which increases the energy footprint of production. Nevertheless, catfish aquaculture has an energy input/energy output ratio that is similar to that for several other major animal protein production activities, such eggs, poultry, and swine production. The nature of ponds, as the most common culture system for catfish, also has important implications for potential environmental impacts. Relative to other commonly used aquaculture production systems, ponds are hydrologically disconnected from water supplies and effluent-receiving water bodies and have long internal hydraulic residence times. These attributes reduce opportunities for pollution, escape of culture species, and disease transfer between captive and wild stocks. These and other aspects of environmental sustainability will be discussed in this presentation, using quantitative indicators of relative environmental performance where possible.

AGRO 247
Review of hybrid catfish research at the National Warmwater Aquaculture Center
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Hybrids between blue catfish (*Ictalurus furcatus*) and channel catfish (*Ictalurus punctatus*) demonstrate favorable production characteristics for economically important traits including growth, survival, and fillet yield compared to channel catfish. However, reproductive barriers between the species have hindered production of catfish fry and limited widespread use of hybrid catfish in the catfish farming industry. Research at the National Warmwater Aquaculture Center (NWAC) in Stoneville, MS has focused on evaluating traits of hybrids, improving production of hybrid catfish fry, and further improving performance of hybrids by selection in the parental species. Research at NWAC related to hybrid production will be reviewed.

AGRO 248
Observed differences in fatty acid profiles for commercially produced channel catfish from Mississippi
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The environment, in conjunction with the management practices used to produce farm-raised channel catfish has the potential to significantly impact nutritional content of the fish. Commercially produced channel catfish are commonly fed a diet based on cornmeal. To assess the interaction of diet and environment, fatty acid profiles were determined for catfish obtained from three geographically separate commercial sources, a research institution, and a natural waterway in Mississippi. Catfish samples were extracted using a modified Folch procedure and extracts were analyzed using GC/MS. Differences between the different sources of fish, based on the observed fatty acid profiles, was determined using classification and regression tree analysis. Significant differences were determined to exist in the profiles based on the source of the catfish. Details of the methods used and the data generated will be presented.

AGRO 249
The catfish farmers of America: Challenges facing the industry
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Abstract text not available.

AGRO 250
A comparison of production systems of Vietnamese basa/tra and Chinese catfish with U.S. farm-raised catfish with implications for health and safety
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Channel catfish (*Ictalurus punctatus*) have been raised commercially in the U.S. since the 1950s. Vietnam has exported basa/tra (*Pangasius* sp.) into the U.S. since 1995, initially targeting the U.S. farm-raised catfish market. Subsequently, Chinese growers have begun to export channel catfish to the U.S. Production systems, management strategies, and approaches to fish health and product safety in Vietnam and China differ from those of the U.S. industry. This presentation will contrast these differences in management practices. For example, imported basa/tra and catfish are raised in surface water rather than the ground water used in the U.S. industry. In Vietnam, cages and net pens are located in rivers used for shipping, disposal of wastes from households, municipalities, and factories, and agricultural run-off. This same water is diverted into the "raceway-ponds" also used to produce basa/tra. The lack of control of such surface water has implications for product health and safety.

AGRO 251
Development of the Food Safety and Inspection Service's catfish inspection program
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The Food, Conservation, and Energy Act of 2008 directs the Food Safety and Inspection Service (FSIS) to implement by January 2010 an inspection program for catfish processed for human consumption. To do this, FSIS formed the Office of Catfish Inspection Programs (OCIP). Based on information from the FSIS proposed rule 'Mandatory Inspection of Catfish and Catfish Products', the FSIS risk assessment for catfish inspection, and the FSIS cost-benefit analysis for catfish inspection, OCIP has tailored an inspection system for domestic and imported catfish and catfish products, and is recruiting a team of talented people to conduct inspection. OCIP is committed to communication and collaboration with stakeholders throughout all stages of its work. This presentation summarizes accomplishments and describes what needs to be done to implement the FSIS Catfish Inspection Program.

AGRO 252
Catfish risk assessment for development of science based regulatory policies
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The 2008 Farm Bill transfers food safety oversight of catfish from the US Food and Drug Administration to the US Department of Agriculture/Food Safety and Inspection Service (USDA/FSIS). FSIS is required to conduct a risk assessment and cost-benefit analysis, under the 1994 Reorganization Act for Agriculture and Executive Order 12866 to ensure food safety policies are cost-effective. Initially, FSIS conducted a pond-to-plate hazard identification to identify the most significant chemical and microbial public health hazards associated with consumption of catfish. Subsequently, a probabilistic risk assessment model was developed to estimate the public health impact -- both acute illnesses and chronic disease –from hazards in imported and domestic catfish. Application of this model to various regulatory scenarios will permit USDA/FSIS to complete benefit-cost analyses for a variety of regulatory scenarios and to maximize the use of USDA/FSIS resources to ensure the safety of catfish consumers.

AGRO 253
Exposure to pesticides in greenhouses: A new modeling approach in Europe
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Operator exposure studies sponsored by ECPA were performed in greenhouses in 2002-2006 within a larger experimental monitoring program in Southern Europe to fill data gaps in existing exposure models. Results are compiled in a database and a proposal for exposure modeling is made. The data base contains information from 7 applicator studies undertaking hand-held spray application using a spray gun/lance connected to a stationary tank and 10 mixing/loading studies using solid or liquid formulations. Studies were conducted in Spain, Italy, Greece and Portugal. Both inhalation and dermal exposure (potential and actual) were measured via whole body passive dosimetry technique. Analysis of work practices and exposure has identified exposure scenarios for high and low crops. The developed data package including a model for use in regulatory exposure assessment is in a commenting period with the Southern European Member States, EU Commission and the European Food Safety Authority (EFSA).

AGRO 254
Greenhouse dissipation of dislodgeable foliar residues of furfural following applications to smooth and hairy leaf ornamentals
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Furfural is registered with the USEPA as a nematicide on greenhouse ornamentals. To support this use, a greenhouse foliar dissipation study was conducted on smooth (poinsettia) and hairy leaf (chrysanthemum) ornamentals treated at proposed label rates with MULTIGUARD® PROTECT (90% furfural a.i.). Following dislodging from leaf disks, furfural was analyzed as its DNPH derivative (LOQ ≈ 3 ng/cm^2 leaf surface) using ACE C18 HPLC equipped with UV detection. Mean foliar residues 1 hour after each of 8 applications were 7.7 ng/cm^2 for poinsettias and 10.2 ng/cm^2 for chrysanthemums which declined to 1.4 and 2.6 ng/cm^2, respectively, 1 day following application. Residues for both plant species were < 3 ng/cm^2 within 8 hours. Furfural foliar dissipation curves were prepared, illustrating rapid residue decline with calculated half-lives of 2 and 3 hours for poinsettia and chrysanthemums, respectively. Following the label-recommended 7-day minimum treatment interval, no carry-over of foliar residues was observed.

AGRO 255
Analytical methodology for an observational worker exposure study in commercial seed treatment facilities involving multiple target compounds
Ian M Murphy, *ian.murphy@bayercropscience.com, Environmental Research, Bayer CropScience, Stilwell, KS 66085*

To support seed treatment products manufactured by Bayer CropScience (BCS), an observational study was performed to determine the potential exposure for workers involved in various work functions associated with operating commercial seed treatment systems. Analytical methods were developed to concurrently measure four active ingredients from several different matrices, including dosimeter garments, hand washes, face wipes, and air sampling tubes. This presentation will describe the analytical methods developed for the specific sample matrices and the precision and accuracy of the methods.

AGRO 256
Validation of analytical methods for the determination of glyphosate in worker exposure matrices by high performance liquid chromatography-tandem mass spectrometry
Henry D. Scobell, *hscobell@eplbas.com, EPL Bio-Analytical Services, Niantic, IL 62551*

Glyphosate, N-(phosphonomethyl)glycine, is a contact herbicide used for broad-spectrum weed and vegetation control. Workers can be exposed to the active ingredient through inhalation of spray droplets or direct contact while mixing, loading and/or applying this herbicide. Four analytical methods were developed and validated to determine glyphosate in whole body dosimeters, face/neck wipes, hand wash solutions and air-sampling tubes. This paper describes the development of laboratory procedures that provide quantitative recovery of glyphosate from the exposure matrices and allow automated concentration on a strong anion-exchange HPLC column. A novel instrument software technique that provides a significant increase in detector sensitivity is also described. The validated limit of quantitation (LOQ) for dosimeters, face/neck wipes and hand wash solutions is 1 µg. The LOQ for air-sampling tubes is 0.01 µg. The validated methods will be used to support future worker exposure studies with glyphosate.

AGRO 257
Probability of exposure to atrazine in northwest Ohio rivers: Long-term trends and seasonal patterns
R. Peter Richards, *prichard@heidelberg.edu, National Center for Water Quality Research, Heidelberg University, Tiffin, OH 44883*

The National Center for Water Quality Research at Heidelberg University has monitored atrazine concentrations in the Maumee and Sandusky Rivers since 1983, with a program focused on storm runoff during the post-application season. This program has generated atrazine concentration data from more than 2000 samples for each river. The

watersheds of these rivers have about 80% row-crop agricultural land use, corn is a major crop, and atrazine is widely applied in these watersheds. Concentrations are usually highest during runoff from the first several storms following application, usually in May and June, and are generally low from about September to the following May. This presentation will mine these data to look for long-term trends in concentrations that may be related to changes in labeling and market share. The data will also be used to assess probability distributions for instantaneous concentrations and for concentrations of selected durations.

AGRO 258
Long-term trend of atrazine residue occurrence in raw water of U.S. Community Water Systems
***Wenlin Chen**, wenlin.chen@syngenta.com, Syngenta Crop Protection, Inc, Greensboro, NC 27419-8300,*

Atrazine monitoring data obtained from raw water samples at each of 103 U.S. Community Water Systems (CWS) were used to examine the occurrence of long-term temporal trends. The data set covers between 5 and 13 years during the period from 1994 to 2006. The CWS are primarily located in areas of high atrazine use (i.e. the Midwestern corn production area), and use surface water bodies for the production of drinking water. Two concentration metrics, time-weighted annual mean (TWAM) and the annual maximum of 90 day rolling averages (M90D), are used as the dependent variables in a statistical mixed effect model developed to incorporate both the fixed effect(i.e. slope) and the random effect (i.e. random variations among different CWS). Results showed that there were significant and negative concentration-time trends in both atrazine TWAM and M90D for these CWS.

AGRO 259
Update of Watershed Regressions for Pesticides (WARP) for predicting atrazine concentration in streams
***Wesley W. Stone**, wwstone@usgs.gov, U.S. Geological Survey, Indianapolis, IN 46278, and Robert J. Gilliom, rgilliom@usgs.gov, U.S. Geological Survey, Sacramento, CA 95819*

Watershed Regressions for Pesticides (WARP) models for predicting atrazine concentrations in streams were updated by incorporating annual atrazine use and annual precipitation data as explanatory variables. The original WARP models were based on atrazine use estimates from either 1992 or 1997. Separate WARP regression models were derived for selected percentiles, annual mean, annual maximum, and annual maximum 21-day, 60-day, and 90-day moving-average concentration statistics. Development of the regression models used the same model development data, model validation data, and regression methods as those used in the original development of WARP. The updated models accounted for more variability in the atrazine concentration statistics among the development sites than the previous WARP models. The explanatory variables used in the updated WARP models include atrazine use intensity, K-factor, R-factor, watershed area, percent contribution from Dunne overland flow, and total precipitation during May and June of the year of sampling.

AGRO 260
Use of estimated stream concentrations in refined endangered species assessments for atrazine
***Steven B Wall**, steven.wall@syngenta.com, Environmental Risk Characterization, Syngenta Crop Protection, Greensboro, NC 27419*

There is a wealth of scientific data available for atrazine in the form of published literature, registrant submitted data and information, regulatory reviews, and other sources. This data set includes measured atrazine concentrations in Midwestern corn and sorghum agricultural watersheds from the Atrazine Ecological Exposure Monitoring Program (AEMP). These data, combined with practical experience from approximately 50 years of registered use as an herbicide, provide excellent opportunities to conduct refined endangered species assessments. This presentation will explore the utility of the AEMP data in the context of refined species-specific assessments for atrazine that utilize best available information both within and outside of the monitored watersheds.

AGRO 261
Modeling atrazine concentrations in small Midwestern watersheds using SWAT
***Michael F. Winchell**[1], mwinchell@stone-env.com, Tammara L. Estes[1], tlestes@stone-env.com, Raghavan Srinivasan[2], r-srinivasan@tamu.edu, and Paul Hendley[3], paul.hendley@syngenta.com. (1) Stone Environmental, Inc, Montpelier, VT 05602, (2) Spatial Sciences Laboratory, Texas A&M University, College Station, TX 77843, (3) Syngenta Crop Protection, Greensboro, NC 27410*

The Soil and Water Assessment Tool (SWAT) was applied to two small agricultural watersheds in Ohio to evaluate the model's capability to predict atrazine concentrations in flowing water bodies. Atrazine use on corn was estimated from yearly county-level use information obtained from Doanes survey data. Simulated atrazine applications were made at the time of corn plantings using two different approaches to estimate planting time. The first method was based upon state-level crop planting dates, while the second approach utilized the SWAT heat unit scheduling model. Both approaches required implementation of a land use disaggregation scheme that permitted applications of atrazine within the watershed to occur at different times. The model was calibrated over a multi-year period using daily observed streamflow and daily soluble atrazine concentrations. The model performance was evaluated using statistical measures of model efficiency applied to both daily time series and ranked daily concentrations. The study found that SWAT could reasonably predict daily atrazine concentrations, but was most capable at predicting an appropriate frequency distribution of concentrations in the study watersheds.

AGRO 262
Modeling the magnitude and duration of atrazine concentrations in small Midwestern watersheds using PRZM-RIVWQ
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A watershed modeling system was tested for three agricultural watersheds in the U.S. cornbelt. The objective of the study was to evaluate the accuracy in predicting the magnitude and duration of atrazine exposure to nontarget aquatic organisms using national, readily available datasets as a potential tool for conducting regional and national watershed assessments. The modeling system linked the Pesticide Root Zone Model (PRZM) with the river water quality model (RIVWQ) to predict atrazine fate and transport in terrestrial and aquatic environments, respectively. Automated processes were used to integrate data from spatial databases, assemble model input files, conduct model runs, and process model results. Data sources included the National Hydrography Dataset (NHD); USGS Hydrologic Unit

Codes (HUC); the National Land Cover Dataset (NLCD); the Agricultural Census; the USDA STATSGO soil database, the National Agricultural Statistics Survey (NASS), and weather data from the National Climatic Data Center (NCDC). Several modifications were made to PRZM to better predict the hydrologic response of the watersheds. Model predictions compare favorably to observed streamflow and atrazine measurements with respect to event magnitude, timing and duration based on both visual and statistical analysis. Automation procedures and default parameter assignments provide tremendous efficiencies in performing preliminary assessments with readily available data. Incorporation of additional localized information can be employed as warranted for detailed site-specific assessments.

AGRO 263
Agricultural air quality research needs working luncheon discussion
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Abstract text not available.

AGRO 264
Microbiological quality of aquacultured catfish (*Ictalurus punctatus*) and the role of organic acids during processing to improve quality
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Aquacultured catfish (*Ictalurus punctatus*) filets were sampled for human pathogenic bacteria in three processing facilities over four seasons. There was a significant difference in the aerobic plate counts due to differences in unit processing operations and seasons. Campylobacter jejuni/coli, Escherichia coli 0157:H7, and Klebsiella pneumoniae subsp. pneumoniae were not isolated. Only Plesiomonas shigelloides and Vibrio cholerae were isolated during the warm weather. Catfish filets were inoculated in combination and individually with Aeromonas hydrophila and Listeria monocytogenes and stored at 2 and 4° C. The filets were periodically evaluated over a two-week storage period. Both bacteria species increased in numbers over the storage time and there was no inhibition of either pathogen by the natural flora on the filets. Catfish filets sprayed with organic (lactic and propionic) acids significantly reduced the microbial counts by 10-fold. Both acids were not significantly different in influencing the aerobic counts of the catfish filets.

AGRO 265
Toward eliminating off-flavors from farm-raised catfish: Bacterial transformations of geosmin and 2-methylisoborneol
***Richard W. Eaton**, richard.eaton@ars.usda.gov, USDA-Agricultural Research Service, Southern Regional Research Center, New Orleans, LA 70124*

The occurrence of the off-flavor chemicals 2-methylisoborneol (MIB) and geosmin in catfish ponds can result in losses of millions of dollars to catfish farmers annually. Since it is difficult to prevent MIB- and geosmin-producing cyanobacterial blooms, a practical solution to the off-flavor problem might be to remove the chemicals by treatment with MIB- and geosmin-degrading bacteria. To this end, bacteria able to grow with various terpenes and coincidentally to transform geosmin and MIB have been isolated and characterized. Several patterns of metabolites were evident. Camphor-degrading bacteria *Pseudomonas putida* G1, *Rhodococcus ruber* T1, and *Rhodococcus wratislaviensis* DLC-cam hydroxylated MIB at all three secondary carbons while R-limonene-degrading *Pseudomonas* sp.19-rlim dehydrated MIB primarily to 2-methylenebornane. Strain DLC-cam and &gamma-terpinene-degrading *Pseudomonas* sp. SBR3-tpnb oxidized geosmin with the production of keto-geosmins. Together, these strains provide a variety of options for off-flavor elimination.

AGRO 266
Use of molecular markers for catfish production and product quality
***Geoffrey C. Waldbieser**, geoff.waldbieser@ars.usda.gov, USDA-Agricultural Research Service, Catfish Genetics Research Unit, NWAC, Stoneville, MS 38776*

Channel catfish are a diploid species native to North America and the primary product of U.S. aquaculture, and molecular genetic research supports selective breeding of catfish for commercial production. To date, short tandem repeat loci have been used to characterize DNA sequence variation within and between catfish populations, determine family structure, and support hybrid catfish research. Recently, large numbers of single nucleotide polymorphisms (SNP) have been identified in the catfish genome and promise to improve the efficiency of genome-based investigations. This presentation will review catfish-specific marker technologies and their current and potential application in catfish production and product quality.

AGRO 267
Catfish imports: Food safety persepectives
***Patty Lovera**, pwoodall@fwwatch.org, Food & Water Watch, Washington, DC 20036*

The presentation will discuss the trends in catfish importation to the United States, historical imported catfish inspection and the changing U.S. regulatory oversight of catfish imports. The presentation will include data covering the Food and Drug Administration's border inspection of catfish over a decade as well as an analysis of the laboratory testing rates for imported catfish and the results of laboratory testing. Discussion will include the FDA's response to emerging threats from the importation of aquacultured catfish raised using chemical and antibiotic agents that are illegal in the United States and the potential impact of moving catfish oversight from the FDA to the U.S. Department of Agriculture.

AGRO 268
Depletion of the triazine compounds melamine and cyanuric acid following single oral administration in catfish, *Ictalurus punctatus*, and trout, *Oncorhynchus mykiss*
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Due to recent human food safety concerns caused by the adulteration of feed products with the triazine compounds melamine and cyanuric acid, information is needed on the depletion of these compounds in animal models. In this study, catfish and trout were given a single 20 mg/kg body

weight (BW) oral dose of melamine, cyanuric acid, or melamine and cyanuric acid together. Necropsies were performed on fish at 1, 3, 7, 14, 28 or 42 days post dose. Filets were removed and tested for residues using LC/MS/MS, and kidneys were examined for renal crystals. Melamine and cyanuric acid residues were highest 1 day following dosing, with mean melamine residues consistently higher than cyanuric acid. Melamine residues were below 2.5ppm by day 7 in catfish and day 14 in trout. Cyanuric acid residues were never above 2.5ppm at any time point and were all below 0.1ppm by day 7.

AGRO 269
Catfish serum neutralization and endopep mass spectrometric assays to detect botulinum in catfish
Patricia S. Gaunt[1]*, gaunt@cvm.msstate.edu, Suzanne R. Kalb*[2]*, skalb@cdc.gov, and John R. Barr*[2]*, jbb0@cdc.gov, (1) College of Veterinary Medicine, Mississippi State University, Thad Cochran National Warmwater Aquaculture Center, Stoneville, MS 38776, (2) National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, GA 30341*

Visceral toxicosis of catfish (VTC) is a syndrome characterized by sudden mortality of apparently healthy market size catfish (*Ictalurus punctatus*). We designed a catfish serum neutralization assay to detect botulinum in catfish with VTC and confirmed this assay by Endopep mass spectrometry (Endopep MS). Sera from six VTC-affected catfish were incubated with either botulinum antitoxin serotypes A, B, C, D, E, or F to identify any neutralization effects. For each serum sample, three experimental fingerlings were injected intracelomically with each serotype-serum mixture and placed separately in an aquarium. Three fish were injected with VTC-affected serum only, and three were injected with unaffected serum only and also placed in separate aquaria. Mortality was seen in fish injected with VTC sera combined with serotype A, B, C, or D as well as the positive controls. No mortality was seen in the fish injected with the sera combined with serotypes E or F or the negative control serum. Centers for Disease Control and Prevention confirmed the presence of botulinum E in the VTC sera samples by Endopep-MS.

AGRO 270
Fluorescence screening of leucomalachite green and leucogentian violet residues in catfish
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The tripheylmethane dyes malachite green (MG) and gentian violet (GV) are effective fungicides, ectoparasiticides and disinfectants in aquaculture. This practice may leave toxic residues in seafood which is not allowed by FDA and other regulatory agencies. In this work, residues of their metabolites, leucomalachite green (LMG) and leucogentian violet (LGV), in catfish is screened by a fluorometric method. After extraction and cleanup, the analyte solution is excited at 265-nm and fluorescence signal is measured at 360 nm. Next, LMG and LGV are oxidized either chemically or electrochemically to non-fluorescent MG and GV, and fluorescence is measured again. This measurement scheme allows effective background subtraction from food matrix therefore enhancing assay sensitivity. The instrument setup, experimental results, and regulatory application to residues screening in seafood will be discussed in details in this presentation.

AGRO 271
Monitoring of producer catfish in Mississippi
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For approximately 10 years Mississippi has been conducting a program monitoring the presence of potential contaminates in producer catfish. Catfish fillets collected by inspectors from the Mississippi Department of Agriculture and Commerce are delivered to the Office of the State Chemist for analysis of pesticides that fall within four broad screening categories: chlorinated hydrocarbon insecticides, organophosphate insecticides, phenoxyacid and urea-based herbicides. The categories at the time were chosen to detect the broadest number of chemicals with the fewest number of analysis to maintain the cost-effectiveness of this unfunded program. To date no detections of any of the pesticides have been observed in any sample. Future funding would allow improvements in this program to monitor for current use pesticides as well as contaminants in imported food commodities.

AGRO 272
Perspective on pesticide bound residues: Overview and implications for regulatory interpretation
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The binding of pesticide residues is an important environmental process in the dissipation of plant protection products. This symposium will provide a better understanding of the physical and chemical nature of the residues, and allow a more accurate representation of the bound residues in environmental exposure/risk assessments. Different assessments are necessary for residues which may be incorporated into the soil matrix, thus eliminating further movement in the soil, versus tightly, but reversibly bound residues which remain available for degradation and movement to various extents. Some thoughts on the types of studies that can better assess the nature of the residues, to allow more realistic exposure assessments, will be introduced.

AGRO 273
Relationship between soil bound residue formation and adsorption processes
Jos Boesten*, jos.boesten@wur.nl, Centre for Water and Climate, Wageningen 6700 AA, Netherlands*

Existing definitions of soil bound residues are more or less operational definitions linked to procedures in the laboratory. Usually quantities in physics and chemistry are based on conceptual definitions from which operational definitions are derived. It is proposed to use as a conceptual definition: soil bound pesticide molecules are molecules that have become bound to the soil solid phase so strongly that they will never return in the liquid phase in soil under field conditions (also not in case of relevant land use changes). This definition has the advantage that it refers to the actual system of interest. From an operational point of view, there is some overlap between soil bound molecules and adsorbed molecules. However, literature data indicate that processes leading to soil bound molecules differ from adsorption/desorption processes and that there is in general little correlation between extent of adsorption and the extent of bound residue formation.

AGRO 274
Desorption resistance of chemicals in soil
***Joseph J. Pignatello**, joseph.pignatello@ct.gov, Soil and Water, Connecticut Agricultural Experiment Station, New Haven, CT 06504*

Sorbed molecules remain immobile and biologically unavailable until they desorb. Chemical residues in soil or sediment that have been aged in the field or laboratory often show a fraction, attributable to the parent chemical, that strongly resists volatilization, aqueous extraction, and biological uptake. This behavior has important implications for natural attenuation, dissipation, risk assessment, bioremediation and analytical methodology, and thus an understanding of the root causes leading to the generation of such fractions is essential. The basis of slow desorption rates is hindered molecular diffusion. The endpoint of hindered diffusion is the state in which molecules are trapped at local matrix sites, and where their release is rate-limited by activated flexing or dissociation of matrix segments. The author will discuss situations that may lead to extraordinarily slow diffusion.

AGRO 275
Perspective on pesticide bound residues: Effect of assumptions on environmental risk assessments
***Russell L. Jones**, russell.jones@bayercropscience.com and Daniel G. Dyer, dan.dyer@bayercropscience.com, Bayer CropScience, Stilwell, KS 66085*

The question of what defines bound residues, how they behave, and how they should be treated in risk assessments has important implications for registration of plant protection products. In each specific situation, a major question is whether bound residues are actually irreversibly bound to soil particles or they are sorbed intact on soil organic matter and are characterized as bound due to inadequate extraction techniques. Assumptions for bound residues in risk assessments can range from permanently bound and inaccessible to leaching, runoff, or soil microbes to completely available and mobile with the same sorption properties as residues prior to binding. Examples presented in this paper show that the assumptions regarding the potentially mobility of bound residues can dramatically affect predicted concentrations in surface and ground water.

AGRO 276
Contributions of humic material fractions to bound residue formation
***James A. Rice**, james_rice@sdstate.edu, and G. Chilom, Department of Chemistry and Biochemistry, South Dakota State University, Brookings, SD 57007*

Natural organic matter present in soils is a complex mixture of humic and nonhumic substances dispersed in a mineral matrix that is often dominated by clays and other nanoparticulate hydrous oxide mineral phases. We have conceptualized NOM as a self-organizing organomineral composite that consists of clay, lipid, and humic acid-like components in which the lipid serves to bind the components together. In the soil, this material is usually referred to as the humin fraction of NOM. Studies using ^{14}C-labeled pesticides applied to soils have shown that for many of these substances most of the applied radioactivity is bound irreversibly to humin. Bound-pesticide residues were prepared by incubating soils with ^{14}C-labeled atrazine (ring- or ethyl-labeled), 2,4-D (ring- or carboxyl-labeled), or DDT (ring-labeled). Ring or functional group labeling of the pesticides resulted in a different distribution between the NOM fractions in the mass balance. For all incubation experiments, the greatest amount of radioactivity was found in the bound-humic acid component of humin. The various NOM fractions were isolated and a mass balance of the pesticide distribution constructed using liquid scintillation counting. These observations have a significant impact on assessing the risk posed by contaminated environments, the choice of appropriate methods for remediation of contaminated environments, and the design and development of new formulations.

AGRO 277
Microwave assisted extraction of PCB bound-residues in aquatic sediments
***Gregory D. Foster**, gfoster@gmu.edu, Sahar Mansoor, smansoor@gmu.edu, and Shahamat U. Khan, skhan6@gmu.edu, Department of Chemistry and Biochemistry, George Mason University, Fairfax, VA 22030,*

Sediment-associated contaminants can exist as bound-residues, characterized as difficult to extract constituents. To explore for the presence of bound residues, aquatic sediments were extracted for 24 hr by conventional Soxhlet extraction. The extracted sediment samples were further treated with either 30% hydrogen peroxide (HP) or 1M $HCl:HNO_3$ (1:1) to oxidize natural organic matter in sediments and possibly to liberate bound PCBs residues. The treated samples were subjected to microwave assisted extraction. It was observed that HP treatment generated twice the extractable PCB concentrations relative to controls (untreated samples) and acid treatment released three times the concentrations of PCBs as compared to the controls. Thus it was determined that a significant amount of the PCBs were present as bound residues in the sediment samples that will not be detected by conventional extraction methods alone, thereby resulting in an under-estimation of the total concentrations of PCBs in aquatic sediments.

AGRO 278
Use of N-15 NMR in studies on the reaction of aromatic amines with soil organic matter to form bound residues
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Aromatic amines result from chemical and microbial transformation of nitroaromatic munitions and several classes of pesticides. Covalent binding of aromatic amines to soil organic matter (SOM) is one of the most recognized pathways for the formation of bound residues. In laboratory reactions, solid and liquid state N-15 NMR has been used to determine the types of covalent bonds formed between SOM and ^{15}N-labeled aromatic amines of varying nucleophilicity and substitution patterns, under both noncatalyzed and enzyme- and metal-catalyzed conditions. Spectra have revealed differences in the distribution of condensation products for the various amines. Solid state N-15 NMR has also been used in whole soil and compost studies to differentiate pathways of transformation and bound residue formation from mineralization and microbial immobilization. The involvement of catalysts in these latter studies remains uncertain. The use of N-15 NMR to determine the long term fate of bound residues has not been fully exploited.

AGRO 279

Determining the bioavailability of highly weathered organochlorine insecticide residues

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Pesticides residues such as DDT/DDE and chlordane are ubiquitous in agricultural soils. Because the contaminants are hydrophobic and degradation-resistant, the residues have become tightly sequestered within the soil. Although contaminant bioavailability is predicted to be low, significant species variability in bioaccumulation has been shown. Root and shoot bioconcentration factors (ratio of contaminant in plant to soil) are typically less than 2 and 0.2, respectively, for most plants but certain cucurbits accumulate 15-20 times more residue than present in the soil. Similar variability has been observed among earthworm species, with bioconcentration factors spanning an order of magnitude. The bioavailability of soil-bound pesticides can be increased by amendments that disrupt soil structure, including surfactants and organic acids. Alternatively, bioavailability can be reduced through the addition of biochar. The number of receptors in a particular soil can also impact contaminant bioaccumulation. The implications of these findings on exposure assessment will be discussed.

AGRO 280

Accounting for unextracted pesticide residues in environmental fate studies

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Unextracted or “bound” pesticide residues are frequently encountered in soil and water metabolism studies. In some cases, more than half of the pesticide residues are left unextracted and unidentified at the end of a study. The residues may be tightly bound to the soil or sediment matrix, or they may be less tightly bound, but not efficiently extracted from the matrix. Sufficient information is often not available to distinguish between unextractable residues and poorly extracted residues. Furthermore, these residues are typically not identified in routine residue analysis, and the significance of these bound residues is generally not known. These problems lead to uncertainties in the estimation of the soil and water burden of total pesticide residues in pesticide ecological risk assessments and drinking water exposure assessments. Current approaches on how to interpret and use metabolism studies with unextracted residues will be discussed in terms of a regulatory context.

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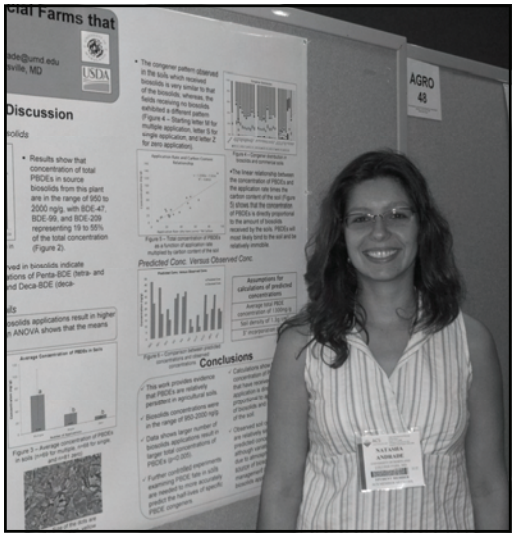

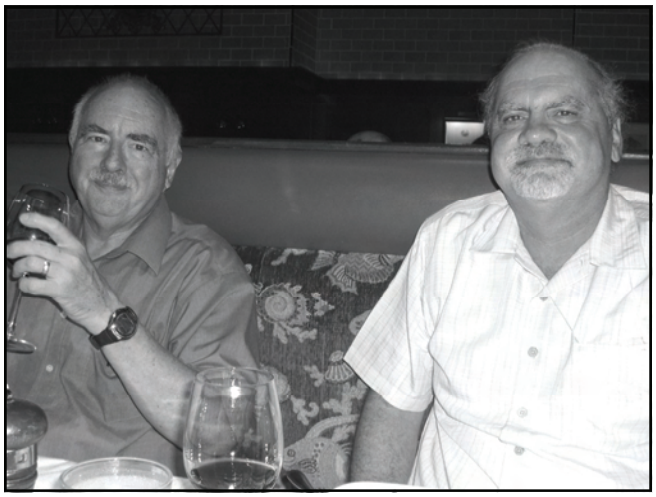

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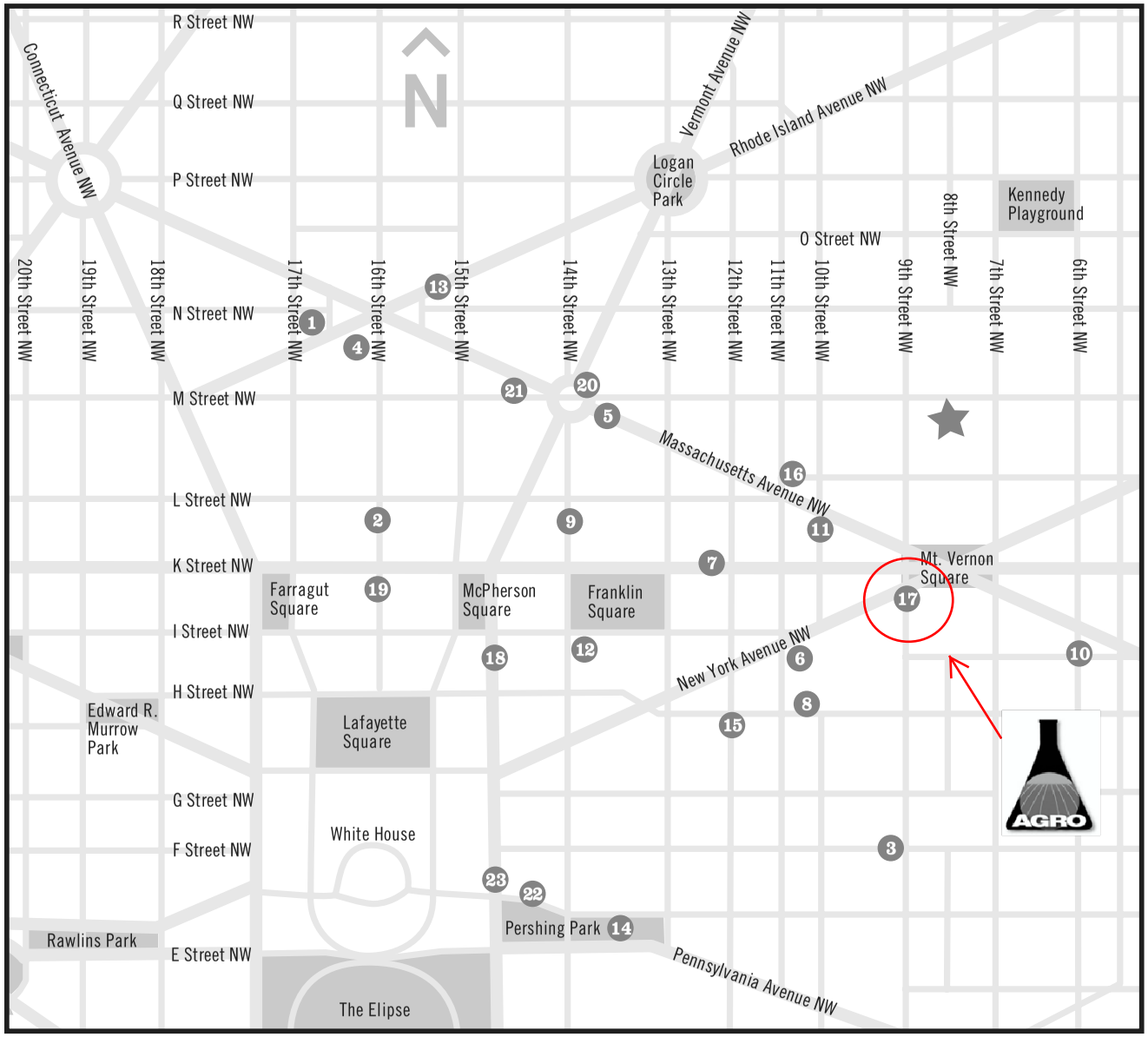

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