TEXAS A&M PLANT BREEDING BULLETIN

November 2015

Our Mission: **Educate and develop Plant Breeders worldwide**
Our Vision: **Alleviate hunger and poverty through genetic improvement of plants**

I am pleased to introduce two of our new faculty to our world-wide audience of the Texas A&M Plant Breeding Bulletin, Dr. Michael Thomson and Dr. Endang Septiningsih.

Dr. Thomson joined the faculty in July 2015 as Professor and H.M. Beachell Chair in International Rice Improvement. Mike's expertise is in plant molecular genetics and his primary interest is in bridging the gap between the genetic diversity held in crop genebanks and its practical use in plant breeding programs in order to accelerate international rice improvement. Mike received his Ph.D. under the direction of Dr. Susan McCouch at Cornell in 2002, followed by a Post Doc at Cornell for a couple of years, two years at the Indonesian Center for Agricultural Biotechnology and Genetic Resources, and most recently, nine years at the International Rice Research Institute (IRRI) in Los Baños, Philippines. At IRRI, Mike led a team of 12 researchers/scholars and was recognized internationally in his field, as evidenced by invited presentations at conferences in 11 countries between 2010 and 2015. His aggressive research program at IRRI in rice molecular genetics yielded "breeder-ready" SNP markers to select for major genes for disease resistance, abiotic stress tolerance, and grain quality, information from genome-wide SNP chips for detecting polymorphism in rice for QTL and association mapping, subspecies-specific markers used for tracking *indica* and *japonica* alleles, and an optimized workflow for high-throughput DNA extraction and SNP genotyping.

Dr. Thomson's research objectives as the Beachell Chair in Rice Improvement will be to apply the latest advances in molecular genetics, high-throughput genotyping and sequencing, and bioinformatics towards QTL and association mapping, allele mining, and

molecular breeding in rice. Dr. Thomson stated, "a goal of my research program is to discover 'hidden' genetic variation in exotic rice germplasm through the development of large-scale backcross populations and introgression lines coupled with next-generation sequencing and high-throughput phenotyping." Other interests include characterizing SNP haplotypes using whole genome sequence data, developing functional markers, and exploring methods to increase the rate of genetic gain in rice breeding programs.

Mike is exploring a number of teaching opportunities, both at the undergraduate and graduate level. He will continue his strong interest in mentoring young scientists through an aggressive graduate student program at TAMU as well as post docs and visiting scientists. We anticipate that Texas A&M University and our plant breeding program will become a highly sought destination for rice visiting scientists under Mike's leadership.

Dr. Septiningsih, "Septi," joined our faculty in August of this year. She too came to us from IRRI where she had a successful research program in genetics and molecular breeding of flooding tolerance. Septi received her Ph.D. with Dr. McCouch at Cornell where her dissertation studies involved QTLs from *Oryza rufipogon* for yield, yield components, grain quality, and fine mapping and gene identification in rice. Following her Ph.D. and one year of postdoctoral work, Dr. Septiningsih returned to Indonesia where she conducted variety identification and genetic diversity analysis in Indonesian rice, sweet potato, and soybean accessions. In 2005, she joined IRRI in Los Baños as a Post Doc to lead the development of submergence tolerant varieties by transferring the *SUB1* gene into a number of mega-varieties through marker assisted backcrossing. These Sub1 varieties have been a great success and a number of these varieties have been released across South and Southeast Asia. She gained the position of Scientist in 2009 and then Senior Scientist by 2013.

During Dr. Septiningsih's work at IRRI, her team identified several major QTLs associated with flooding tolerance during the vegetative stage of rice development that may complement the *SUB1* gene and be useful targets for breeding purposes. Additionally, many QTLs were identified under stagnant flooding conditions, where plants are not

completely submerged but water is under the canopy or to 60 cm until harvesting time. These QTLs were related to yield, yield components, and other important agronomic traits associated with stagnant flooding tolerance. Her team also identified major QTLs for anaerobic germination (AG) tolerance, an important trait for direct-seeded rice. A key gene underlying the AG tolerance was identified and its impact on genome-wide expression was characterized. Septi's molecular markers and improved breeding lines developed at IRRI are expected to significantly contribute to improving the lives of resource-poor farmers on about 20 million ha that are affected annually by excess or ill-timed flooding.

Dr. Septiningsih will continue her research interests in rice genetics and genomics for different traits such as abiotic stresses, yield, yield components, and grain quality using modern tools. Septi also will use her molecular genetic interests in other crops of importance to Texas producers.

Dr. Septiningsih will teach a distance delivered section of our Complex Genomes course beginning in the 2016 Spring Semester along with directing graduate students and hosting visiting scientists. Her international experience will enhance our global reputation in plant breeding expertise.

Welcome Drs. Thomson and Septiningsih.

Distance Plant Breeding Program and Continuing Education courses available for Fall 2015. Courses for Spring 2016 will be listed in the November Plant Breeding Bulletin and online at https://scsdistance.tamu.edu/available-courses/.

Continuing Education Available Courses
Spring Courses: January 19– May 11, 2016

To fully participate in our continuing education courses, students should have:

- High speed internet connection and updated browsers, including Internet Explorer and either Chrome of Firefox
- Common plug-ins (e.g. Adobe Reader, Flash Player, Virus Protection, Java, etc.)
- Speakers and Webcam with microphone
- Skype
- Ability to either scan or fax course documents to the instructor

Spring 2015

Plant Breeding Fundamentals – Full Course (3 Units) – Cost $679.65

January 19-May 11, 2016

Introduction to the field of plant breeding for students without a plant breeding background. Includes common plant breeding terminology and introduction of concepts. Genetic improvement of crops by hybridization and selection; special breeding methods and techniques applicable to naturally self-pollinated, cross-pollinated and asexually reproduced plants.

Basic Plant Breeding - Full Course (3 Units) - Cost - $679.65
January 19-May 11, 2016

Basic Plant Breeding can be taken as an entire course (all three units) or each unit can be taken individually. For participants in our Professional Certificate in Plant Breeding and Genetics, completion of all three units is required.

Unit 1 - Introduction to Basic Plant Breeding *Cost - $226.55*
January 19 – February 19, 2016
Introduction to Basic Plant Breeding provides a review of plant reproduction, genetic variation, gene banks, germplasm preservation, gene segregation, the power of selection and its role in plant breeding, and an introduction to intellectual property and its role in the life of a plant breeder. This unit is designed to prepare the participant to explore the genetics and methodologies employed by plant breeders of self and cross pollinated crop species in units two and three of Basic Plant Breeding.

Unit 2 - Breeding Self Pollinated Crops *Cost - $226.55*
February 22 – April 1, 2016
The frequency of any specific heterozygous locus will be reduced by 50% for every generation of selfing, resulting in a mixture of homozygous lines within any natural population. Phenotypic selection within heterozygous generations will lead to homozygous or near homozygous germplasm lines or cultivars under self-pollination. This unit is designed to communicate plant breeding methodologies that take advantage of the genetic consequences of natural or forced self-pollination in agronomic crops. Topics will include: [1] the basics of segregation, [2] breeding methodologies, [3] the grain sorghum conversion program-an example of backcrossing in a different direction, [4] review of a commercial soybean cultivar development program, and [5] a review of the types of genetic releases from Texas A&M AgriLife Research.

Unit 3 - Breeding Cross Pollinated Crops *Cost - $226.55*
April 1 – May 11, 2016
Topics covered include: quantitative genetics and plant breeding, effects of selection on Hardy Weinberg Equilibrium, mating designs with cross pollinated crops, breeding methods for cross pollinated crops, deviations from Mendelian ratios, genetic male sterility and hybrid seed production, seed certification and types of release.

Recommended textbooks are “Breeding Field Crops” by J.M. Poehlman and D.A. Sleper, and “Principles of Cultivar Development” by W.F. Fehr. A final exam will allow the participant to assess their grasp of topics covered. Participants in the Plant Breeding and Genetic Certificate Program must score 70% on the final exam for each unit.

This is a "self-paced" course and is available for viewing for a limited time. Time commitment is individual student driven. Few outside assignments are made. Students should view each lecture, review all previous lectures and be prepared to discuss any issues that are unclear. Each unit has a printable note set and most units have a set of review questions that can be used as a tool to check your comprehension and grasp of unit concepts. Feel free to contact the instructor, Dr. Wayne Smith, by e-mail (cwsmith@tamu.edu) or phone (979-845-3450) with any questions you have or if you need additional information.

Analysis of Complex Genomes – Full Course (3 Units) – Cost - $679.65
January 19-May 11, 2016

Genome structure, organization and function of model organisms and higher eukaryotes; theory and methodology of genetic and physical mapping, comparative genomics, sequencing, sequence analysis and annotation; emphasis on understanding the function of complex genomes, genome-wide expression analysis, genetic and epigenetic

mechanisms; X-inactivation, imprinting, gene silencing, transposons, genome duplication and evaluation. Requires an in-depth and working knowledge of basic and advanced plant breeding concepts.

Unit 1 – DNA Marker Technology and Genetic Mapping *Cost - $226.55*
January 19 – February 19, 2016

Unit 2 – Recombinant DNA and Cloning *Cost - $226.55*
February 22 – April 1, 2016

Unit 3 – Sequencing Genomes and Other Genomic Tools *Cost - $226.55*
April 1 – May 11, 2016

Quantitative Genetics and Plant Breeding - Full Course (3 Units) - Cost - $679.65 January 19-May 11, 2016

Applied aspects of quantitative genetics in plant breeding; examination of methodologies to analyze quantitative variation in crop species; genetic phenomena (inbreeding, heterosis and epistasis); quantitative trait loci (QTL) mapping and marker-assisted selection (MAS); genotype by environment interaction, heritability multiple traits and selection theory with implications in plant breeding. Requires an in-depth and working knowledge of basic and advanced plant breeding concepts.

Intellectual Properties in the Plant Sciences - Full Course (3 Units) - Cost - $679.65 January 19-May 11, 2016

This course introduces the major foci of intellectual property (IP) impacting plant sciences, including: 1) traditional vs. emerging knowledge economies, 2) governing U.S. statutes and international treaties, 3) forms of IP protection, and 4) IP asset identification, valuation, capture, and deployment towards an understanding of best practices for the development of effective IP strategies and management of IP portfolios.

Unit I - Introduction to Intellectual Property, International Treaties and Patents *Cost - $226.55*
January 19 – February 19, 2016
Unit I of the Intellectual Properties in the Plant Sciences Course. Topics covered include: IP Culture and the Knowledge Economy, Traditional Knowledge vs. Biopiracy, Sui generis Systems, International Treaties, Overview of Patentability, Utility Patents, and Plant Variety Patents.

Unit II - Intellectual Property Documentation *Cost - $226.55*
February 22 – April 1, 2016
Unit II of the Intellectual Properties in the Plant Sciences Course. Topics covered include: Trademarks, Copyrights, & Trade Secrets; USPTO; Inventorship, Ownership, Compensation, IP Training; Confidential Information; IP Audit; IP Value; Competitive Intelligence; Cyberspace – IP and IT Cooperation.

Unit III - Intellectual Property Transfer and Enforcement *Cost - $226.55*
April 1 – May 11, 2016

Unit III of the Intellectual Properties in the Plant Sciences Course. Topics covered include: Intellectual Property Transfer and Enforcement, IP Case Studies, IP Portfolio, IP Strategy and Leveraging IP Value.

Introduction to Host Plant Resistance (1 Units) - Cost - $226.55

January 19 – February 19, 2016
Host plant resistance programs from the standpoint of the plant breeder.

Other Academic and Continuing Education courses in plant breeding and related disciplines that will be available during other semesters include Host Plant Resistance; Crop Production; Selection Theory; Marker Assisted Selection; Genomic Analysis; Field Crop Diseases; Field Insects; Essential Nutrients in Crop Growth; and others. For more information visit https://scsdistance.tamu.edu/ or contact LeAnn Hague, Distance Education Coordinator in Soil and Crop Sciences at leann.hague@tamu.edu or (979)845-6148.

Distance Plant Breeding M.S. and Ph.D. degree programs at Texas A&M. Visit https://scsdistance.tamu.edu/plant-breeding-distance-education/ for details.

Please direct comments concerning this bulletin to Wayne Smith, cwsmith@tamu.edu or 979.845.3450.