

Proceedings of the 13<sup>th</sup> International  
Wheat Genetics Symposium

April 23-28, 2017 - Tulln, Austria



13<sup>th</sup> International  
**Wheat Genetics**  
Symposium



# Proceedings of the 13<sup>th</sup> International Wheat Genetics Symposium

April 23-28, 2017 - Tulln, Austria

## Editors

Hermann Buerstmayr, Christina Lang-Mladek, Barbara Steiner, Sebastian Michel, Maria Buerstmayr, Marc Lemmens, Johann Vollmann, Heinrich Grausgruber

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P 181 - Topic: Applying Novel Tools to Practical Wheat Improvement

### **Association mapping in elite durum wheat reveals strong differential selection for a major root depth QTL according to water regime**

Giuseppe Sciarra<sup>1</sup>, Kerstin Nagel<sup>2</sup>, Silvio Salvi<sup>1</sup>, Marco Maccaferri<sup>1</sup>, Jonas Lentz<sup>2</sup>, Tania Gioia<sup>2</sup>, Fabio Fiorani<sup>2</sup>, Roberto Tuberosa<sup>1</sup>

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 Giuseppe Sciarra     giuseppe.sciara2@unibo.it

**Key message:** This study reports a QTL region with major effects on root depth and other root system architecture and shoot development traits, and shows how this QTL was differentially selected according to the prevailing water regime.

Root system architecture (RSA) is receiving increasing attention from the scientific and breeding communities because of its implications in water and nutrient uptake and thus on the capability of plants to cope with drought and nutrient starvation. This notwithstanding, phenotyping roots remains a major challenge because of its intrinsic difficulty. This study reports the characterization of 183 elite durum wheat (*Triticum turgidum* L. var. *durum* Desf.) for RSA and shoot developmental traits. Plants were grown in controlled conditions up to the 7th leaf appearance (late tillering) using the phenotyping platform GROWSCREEN-Rhizo at the Institut für Bio und Geowissenschaften Pflanzenwissenschaften. The depth (75 cm) of the rhizotrons of the platform and its automation allow for a quantitative, dynamic measurement of RSA parameters in 2D for most of the vegetative growth stage. The following RSA traits were measured: seminal root length, nodal root length, lateral root length, root system convex hull and root system width and depth distribution (twice per week). Measurements of leaf area, leaves number and tiller number were performed twice per week and SPAD measurements were collected twice along the experiment. Root dry biomass and shoot fresh and dry biomass were collected at the end of the experiment. A genome-wide association study (GWAS) based upon the Illumina Infinium 90K SNP assay identified 502 main loci associated with variation of RSA and/or shoot growth traits ( $p < 0.0001$ ). GWAS confirmed a highly significant effect on adult plant root system width due to two QTLs on chromosome 6AL and 7A previously identified on seminal root at the seedling stage (Maccaferri et al. 2016). Furthermore, haplotype frequency at one of the main QTL cluster on chromosome 7Ac significantly associated with root depth, root system width, root specific weight and shoot/root ratio revealed a strong, contrasting selection pattern between the rainfed and the artificially watered breeding programs conducted at ICARDA and CIMMYT, respectively, suggesting an indirect but major role of RSA in durum wheat breeding.

#### Acknowledgements

European Plant Phenotyping Network, DROPS and EUROOT projects from the European Community's Seventh Framework Program under the Grant Agreements n° FP7 - 244374 and 289300.

#### Reference

Maccaferri M, El-Feki W, Nazemi G, Salvi S, Canè MA, Colalongo MC, Stefanelli S, Tuberosa R (2016) Prioritizing quantitative trait loci for root system architecture in tetraploid wheat. *J Exp Bot* 67: 1161-1178.



## Short history of International Wheat Genetics Symposia (IWGS)

- 1<sup>st</sup> IWGS August 11-15, 1958 in Winnipeg, Canada
- 2<sup>nd</sup> IWGS August 19-24, 1963, Lund, Sweden
- 3<sup>rd</sup> IWGS August 5-9, 1968, Canberra, Australia
- 4<sup>th</sup> IWGS August 6-11, 1973, Columbia, Missouri, USA
- 5<sup>th</sup> IWGS February 23-28, 1978, New-Delhi, India
- 6<sup>th</sup> IWGS November 28- December 3, 1983, Kyoto, Japan
- 7<sup>th</sup> IWGS July 13-19, 1988, Cambridge, England
- 8<sup>th</sup> IWGS July 20-25, 1993, Beijing, China
- 9<sup>th</sup> IWGS August 2-7, 1998, Saskatoon, Canada
- 10<sup>th</sup> IWGS September 1-6, 2003, Paestum, Italy
- 11<sup>th</sup> IWGS August 24-29, 2008, Brisbane, Australia
- 12<sup>th</sup> IWGS September 8-14, 2013, Yokohama, Japan

### FIRST INTERNATIONAL WHEAT GENETICS SYMPOSIUM

UNIVERSITY OF MANITOBA  
Winnipeg - Manitoba - Canada  
AUGUST 11th - 15th, 1958



LEFT TO RIGHT—Sitting: W. H. Johnston, Canada; W. W. Siler, U.S.A.; E. R. Ausonius, U.S.A.; W. Q. Loewring, U.S.A.; J. C. Foad, Iraq; N. E. Borlaug, Mexico; R. de Villemortin, France; H. C. Thorpe, Kenya; A. G. O. Whitehead, Canada; L. P. Iltz, U.S.A.; K. Yamashita, Japan; P. A. Sarcolla, U.S.A.; H. Kihara, Japan; B. C. Jenkins, Canada; E. R. Sears, U.S.A.; A. Mintzing, Sweden; R. C. McGinnis, Canada; J. E. Andrews, Canada; O. N. Sosa, Guatemala; J. M. Poehlman, U.S.A.; J. Ortega, Mexico; T. E. Haas, U.S.A.; W. H. Foote, U.S.A.; H. A. Sheybani, Iran.

STANDING—1ST ROW: D. G. Hamilton, Canada; S. B. Helgason, Canada; E. C. Stakman, U.S.A.; C. O. Johnson, U.S.A.; T. H. Shea, Formosa; M. Norhona-Wagner, Portugal; M. J. Pinthus, Israel; A. Camara, Portugal; G. Dantuma, Netherlands; R. I. Larson, Canada; M. Rommel, Canada; H. W. Li, Formosa; R. M. Caldwell, U.S.A.; A. T. Pugsley, Australia; R. W. Romig, Colombia; F. N. Briggs, U.S.A.; W. H. Leonard, U.S.A.; J. W. Gibbs, Colombia; K. W. Finlay, Australia; K. L. Mehra, India; M. S. Chennaveeriah, India; J. B. Hair, New Zealand; N. D. Williams, U.S.A.; Z. A. Munshi, Pakistan; M. S. Haq, Pakistan; V. C. Finkner, U.S.A.; H. Meyer, Canada; V. A. Dirks, U.S.A.; K. L. Lebsack, U.S.A.; V. A. Johnson, U.S.A.; E. A. Hurd, Canada; K. Tsunetsuki, Canada; R. M. Heermann, U.S.A.; R. Takahashi, Japan; L. W. Briggie, U.S.A.; S. Matsumura, Japan; A. B. Misson, Canada; T. E. Steu, U.S.A.; Y. Shoto,

Japan; A. B. Schooler, U.S.A.; D. R. Metcalfe, Canada; R. Ribey, England; W. G. Malhier, Canada; J. Vallaga, Argentina; J. P. MacKay, Sweden; L. H. Shebicki, Canada; D. W. Robertson, U.S.A.; H. L. Shands, U.S.A.; D. J. Samborska, Canada.

STANDING—2ND ROW: A. B. Campbell, Canada; R. G. Anderson, Canada; W. J. White, Canada; E. D. Patti, Canada; D. W. Sanderson, U.S.A.; C. W. Schaller, U.S.A.; D. W. George, U.S.A.; R. J. Metzger, U.S.A.; E. H. Everson, U.S.A.; S. Borovicic, Yugoslavia; J. R. Schaeffer, U.S.A.; F. J. Gough, U.S.A.; D. Markarian, U.S.A.; W. E. Hall, U.S.A.; E. G. Heyne, U.S.A.; D. R. Knott, Canada; J. S. Bakshi, India; A. V. Vincent, France; J. B. Harrington, Italy; A. M. Scheluber, U.S.A.; B. I. H. McKenzie, Canada; R. S. Caldecott, U.S.A.; O. P. Kanora, India; P. G. Sandil, U.S.A.; F. H. McNeal, U.S.A.; W. M. Bonclen, Canada; E. B. Hehn, U.S.A.; G. R. Rhoads, U.S.A.; A. R. da Silva, Brazil; A. G. Kueck, Canada; K. Matsumoto, Japan; D. S. McRae, Canada; G. S. Smith, U.S.A.; E. E. Sebesta, U.S.A.; M. N. Grant, Canada; O. A. Vogel, U.S.A.; C. A. Lamb, U.S.A.; J. W. Schmidt, U.S.A.; C. R. Amstrup, U.S.A.; M. Sasaki, Japan; M. J. Eberts, Canada; H. Gaul, Germany; R. Gonzalez, Chile; D. R. Johnston, U.S.A.; Unidentified; M. R. Goni, Argentina; G. F. Konzak, U.S.A.; E. Sanchez-Monge, Spain; F. X. Laubscher, South Africa; M. Mounantsu, Japan; R. F. Peterson, Canada; H. G. Young, Jr., U.S.A.; G. J. Green, Canada; W. K. Pope, U.S.A.



## International Organizing Committee, Reviewers, and Supporters

### **Yasunari Ogihara**

Kihara Institute for Biological Research, Yokohama City University, Japan  
*Role: Head of IOC*

Yasunari Ogihara teaches Plant Genomics at the Department of Life and Environmental Sciences, Yokohama City University, Japan. He is former head of the Kihara Institute for Biological Research, Yokohama City University. He would like to contribute production of useful crops for sustainable cultivation with the novel biotechnology. His interest is focused on the functional genomics of polyploid wheat. He contributed to perform the nucleotide sequencing of chloroplast, mitochondria and nuclear genomes of Chinese Spring wheat. He carried out the research work on comprehensive gene expression patterns of common wheat in response to developmental and/or environmental conditions. He applies genomics to improve grain quality and omit allergens of wheat flour. He also aims to improve stresses-resistance of common wheat using genetic and genomic resources. His activities are available at: <http://pgenome.sci.yokohama-cu.ac.jp/>



### **Ahmed Amri**

International Center for Agricultural Research in the Dry Areas (ICARDA,  
[www.icarda.org](http://www.icarda.org)), Morocco  
*Role: IOC and Reviewer*

Holds a PhD Genetics and Plant Breeding from Kansas State University (1989); worked at INRA-Morocco for 20 years as cereal breeder (release of 17 barley varieties, 5 triticale and 7 bread wheat and durum varieties resistant to Hessian fly). Ahmed Amri works at ICARDA since 1999 as regional coordinator for a GEF West Asia Dryland Agrobiodiversity project (1999-2005), ICARDA Regional Coordinator for West Asia (2001-2008), Coordinator Iran-ICARDA office (2005-2009) and since 2008, appointed as the Head of Genetic Resources Unit and Deputy Director of the Biodiversity and Integrated Gene Management Program. He has a total of 132 publications including 72 in refereed journals and advised 27 PhD and MSc. students. His expertise is in pre-breeding, breeding of cereals, *ex situ* conservation of plant genetic resources and on approaches for promoting the *in situ*/on-farm conservation of dryland agrobiodiversity.



### **Alexey Morgounov**

International Maize and Wheat Improvement Center (CIMMYT), Winter Wheat Program in Turkey, Head of IWWIP ([www.iwwip.org](http://www.iwwip.org))  
*Role: Reviewer*

Several achievements were accomplished in the last 10 years: 1) More than 70 IWWIP originated varieties have been released in the region and occupy more than 2.5 mln ha. 2) National wheat landraces inventory completed in Turkey with collections covering 60 provinces and thousands of lines characterized and evaluated. 3) Winter wheat germplasm resistant to Ug99, stripe rust, common bunt and soil-borne pathogens was identified and distributed through IWWIP international nurseries. 4) Winter hexaploid synthetics were developed, characterized and included into breeding.





**Andreas J. Obrecht**

**Austrian Agency for International Cooperation in Education and Research (OeAD GmbH), Austria**

*Role: Facilitator for Public Evening Discussion*

Andreas Obrecht is a social and cultural anthropologist, writer and sociologist; habilitation in sociology with an emphasis on developmental sociology (1997); head of the Interdisciplinary Research Institute for Development Cooperation (IEZ), Johannes Kepler University Linz (1998-2009); visiting professor for the thematic focus Sub-Saharan Africa and South Pacific at the Department for Contemporary History, Karl Franzens University Graz (1998-2013); since 2004 host for science and culture in the ORF-radio broadcast „Von Tag zu Tag“; since 2009 head of the Commission for Development Research ([www.kef-research.at](http://www.kef-research.at)) at the Austrian Agency for International Cooperation in Education and Research (OeAD GmbH) and head of the Austrian Partnership Programme in Higher Education and Research for Development ([www.appear.at](http://www.appear.at))

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**Bernd Friebe**

**Wheat Genetics Resources Center at Kansas State University, USA**

*Role: Reviewer*

I received my Ph.D. in 1977 from the Free University of Berlin and after postdocs at the Technical University in Munich-Weihenstephan and the University of Manitoba, Winnipeg, I joined the Wheat Genetics Resources Center at Kansas State University in 1991. My research focusses on the molecular cytogenetics and evolution of wheat and its wild relatives with special emphasis on the transfer and characterization of agronomically useful alien genes from distantly related wild species into bread wheat using directed chromosome engineering. I am also involved in the management of wheat genetic resources, germplasms, and genetic stocks.

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**Cristobal Uauy**

**John Innes Centre, Norwich, UK.**

*Role: IOC and Reviewer*

Cristobal Uauy is a Project Leader in wheat genetics and genomics at the John Innes Centre. He studied Agronomy in Chile and holds a PhD in Genetics from the University of California, Davis. His work was recognized as the most outstanding PhD dissertation in Biological and Life Sciences in the US and Canada (2007). His programme focuses on the identification of genes involved in wheat productivity traits, including grain size/yield, and the development of tools and resources to enhance scientific discovery. Uauy is using molecular genetic approaches to identify these genes and enhance the pipeline to translate new knowledge at the molecular level into improved wheat varieties for growers, industry and consumers. Cristobal's work has been recognized through the Bayer Foundation Early Excellence in Science Award (2012) and the Society of Experimental Biology President's Medal (2014).

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**Elena Salina**

**Laboratory of Plant Molecular Genetics and Cytogenetics at the Institute of Cytology and Genetics (IC&G) in Novosibirsk, Russia.**

*Role: IOC and Reviewer*

Head of the laboratory, joined the Institute in August 1981 after graduation from Moscow University. Her main scientific interest was connected with reorganization wheat genome during remote hybridization, amphi-ploidization and evolution. The last years one of the research directions of her lab was focused on identification genes and alien translocations responsible for wheat agricultural traits such as resistance to disease, heading time, spike morphology. This information is then used for improving methods and strategies for harnessing allelic diversity of wheat relatives and hybrids and using its in wheat breeding. Elena Salina is a team leader in IWGSC since 2007 and responsible for physical mapping and sequencing of 5BS chromosome.



**Eva Stoeger**

**University of Natural Resources and Life Sciences Vienna, Austria**

*Role: Speaker at the Public Evening Discussion*

Eva Stoeger is Professor of Molecular Plant Physiology at the University of Natural Resources and Life Sciences in Vienna, Austria. Eva Stoeger holds a PhD from from the University of Vienna. Further stages in her career brought her to the University of Florida (USA), the John Innes Centre, Norwich (UK), and at the Aachen Technical University (Germany). Her main research interests are in the areas of cereal biotechnology, endomembrane dynamics and the production of high-value recombinant proteins in seed crops. <http://www.boku.ac.at/en/personen/person/EDCFD1D522BED587/>



**Franziska Löschenberger**

**Saatzucht-Donau, Probstdorf, Austria**

*Role: Speaker at the Public Evening Discussion*

Franziska graduated at the University of Natural Resources and Life Sciences Vienna, she did her PhD studies in the field of doubled haploids in wheat. She is working for Saatzucht-Donau, a medium sized Austrian plant breeding company as wheat breeder. She has attained 175 cultivar registrations of 100 bread wheat and durum wheat cultivars in 18 countries on three continents. She has till now developed 50 winter wheat cultivars from crossing to cultivar registration. Her breeding program covers wheat cultivars for conventional farming and for organic farming, with a particular emphasis on stable performance, resilience and superior end use quality. <http://www.saatzucht-donau.at/>





**George Fedak**

Ottawa Research and Development Centre, Agriculture and Agri-food Canada, Ottawa, Ontario, Canada

*Role: Reviewer*

George Fedak is a principal research scientist at the Ottawa Research and Development Centre of Agriculture and Agri-food Canada in Ottawa, Canada. His main research interests focus on cytogenetic studies of interspecific and intergenetic hybrids in wheat for progress of resolving genomic relationships and transfer of disease resistance from the alien species to wheat. Thus far QTL for resistance to Fusarium head blight from five alien species have been introgressed into wheat and mapped. These genes are being pyramided and used to augment FHB resistance in spring wheat breeding programs. For resistance to Ug99, pyramids of up to four known resistance genes have been built up by mean of DH technology and markers. The pyramids have been crossed and backcrossed into spring and winter varieties and widely distributed to wheat improvement programs. The screening of cytogenetic stocks and alien species for Ug99 resistance has revealed numerous sources of resistance. Procedures are underway to introgress these into wheat.

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**Hans-Joachim Braun**

CIMMYT – Centro Internacional de Mejoramiento de Maíz y Trigo, Mexico

*Role: speaker at the public evening discussion*

He serves as the Director of CIMMYT's Global Wheat Program (GWP) since 2006 and Director of the CGIAR Research Program on Wheat (WHEAT) since 2015. Based in Mexico, Braun leads and manages 40 internationally recruited scientists as part of the GWP. His achievements include contributing to the development and release of 44 winter wheat varieties grown on 2 million hectares in Central and West Asia. Prior to his current position, Dr. Braun led the Turkey International Winter Wheat Improvement Program. During his 20 years in Turkey he was also involved in identifying Zn deficiency and soil borne diseases as production constraints for wheat production in rainfed areas of Central Anatolia and other regions in West Asia. In 2003 he received the Chinese Friendship Award for his contributions to wheat improvement in Gansu Province. Braun currently holds positions as a board member for the Wheat Initiative and the International Wheat Yield Partnership.

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**H el ene Lucas**

Institut National de la Recherche Agronomique, France

*Role: IOC and Reviewer*

After a scientific career dedicated to the analysis of plant genomes organisation and evolution, with a special focus on retrotransposons, H el ene Lucas took the role of Head the Genetics and Plant Breeding Division of INRA (2005-2011). As its International Scientific Coordinator, she established successfully the G20-endorsed Wheat Initiative from 2011 to 2016, while chairing the Managing Board of the French "Plant Biotech" Public-Private Partnership Scientific Group. She is now Scientific Advisor to the President and CEO of INRA.

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**Helmut Haberl**

**Institute of Social Ecology, Alpen Adria Universitaet Klagenfurt/Graz/Wien,  
Vienna Austria**  
*Role: Keynote Opening Speaker*



Helmut Haberl studied biology, ecology and mathematics at the Universities of Vienna and Salzburg. PhD 1995, Habilitation 2001, both University of Vienna. He currently serves as director of the Institute of Social Ecology at the Alpen-Adria Universitaet Klagenfurt, Wien, Graz in Vienna. His mission is to contribute to sustainability through inter- and transdisciplinary research on society-nature interaction, with a focus on society's use of biophysical resources such as raw materials, energy, and land. He has pioneered socioecological sustainability indicators such as the human appropriation of net primary production (HANPP) as well as indicators for the energetic metabolism of societies and contributed to the emergence of the research field of Long-Term Socio-Ecological Research (LTSER). He served on the SSC of the Global Land Project, the Scientific Committee of the European Environment Agency and in contributed to the Global Energy Assessment, IPCC's Fifth Assessment Report (AR5, WGIII) and the Austrian Panel on Climate Change's (APCC) first Austrian Climate Assessment Report 2014. Further information is available at: <http://www.uni-klu.ac.at/socec/eng/inhalt/885.htm>

**Hermann Buerstmayr**

**University of Natural Resources and Life Sciences Vienna, Austria**  
*Role: Head of LOC and Reviewer*



He teaches Plant Breeding at the University of Natural Resources and Life Sciences Vienna. His mission is to contribute to sustainable improvement of crop production through genetics and genomics research and capacity building. His main research interests focus on disease resistance in crop plants, particularly on wheat. He is recognized as a leading expert in Fusarium head blight resistance research. He aims to combine germplasm improvement, with classical and molecular genetics and genomics in order gain novel knowledge. At the same time improved germplasm, sometimes from exotic sources and wild relatives, is generated and made available for practical breeding. Further information is available at: <http://www.ifa-tulln.boku.ac.at/en/institut-fuer-biotechnologie-in-der-pflanzenproduktion/>

**Mark E. Sorrells**

**Cornell University, Ithaca, USA**  
*Role: IOC and Reviewer*



Mark E. Sorrells joined the faculty at Cornell University in the Department of Plant Breeding & Biometry in 1978. Currently, he is a Professor in the Department of Plant Breeding & Genetics. The primary focus of Dr. Sorrells' research program is on breeding methodologies incorporating new technologies such as high throughput phenotyping and genomic selection. His breeding program has released 18 small grains varieties. He has published more than 260 papers in peer-reviewed journals and served as major advisor to 37 PhD students and 15 M.S. graduate students. Further information is available at: <http://smallgrains.cals.cornell.edu>



**Parveen Chhuneja**

School of Agricultural Biotechnology, Punjab Agricultural University, Ludhiana, India

*Role: IOC and Reviewer*

Dr. Parveen Chhuneja has been working on wheat hybridization for more than 20 years and presently is the Director, School of Agricultural Biotechnology, Punjab Agricultural University, Ludhiana. She has identified and transferred a number of novel alleles and genes from progenitor and non-progenitor Aegilops and Triticum species to cultivated wheat. Her group has transferred and mapped a number of alien genes for disease resistance, productivity and quality traits which are being used in the wheat varietal development programme for diversifying the breeders' germplasm base. Dr Chhuneja is responsible for maintaining and utilising the largest collection of wild species of wheat among all the National Institutes and SAUs in India. She has supervised 17 post-graduate students. Dr Parveen Chhuneja has worked as visiting scientist at Institute of Plant Molecular Biology, University of Zurich, Switzerland and John Innes Centre, UK. Dr Chhuneja has also been awarded Merit Certificate and Plaque by her University in recognition of her outstanding research contributions. She has been awarded Dr Gurdev Singh Khush Distinguished Professor award by her institution for 2016-19.

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**Peter Langridge**

Wheat initiative and University of Adelaide, Australia

*Role: IOC and Reviewer*

Peter is Emeritus Professor at the University of Adelaide, Australia. Peter established the Australian Centre for Plant Functional Genomics (ACPGF) and was appointed Chief Executive Officer in 2003. In 2014 Peter resigned as CEO of ACPGF to focus on his role on the boards of several research organisations in Europe, North America and in developing countries. Peter's interests have focused on the role of modern technologies in crop improvement with a particular focus on the importance of science and education in helping to improve food security. Further information is available at: <http://www.adelaide.edu.au/directory/peter.langridge>

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**Peter Sharp**

University of Sydney, Australia

*Role: Reviewer*

Peter Sharp teaches in the areas of genetics, plant breeding and biotechnology in the School of Life and Environmental Sciences at the University of Sydney. He is Head of the Plant Science Cluster in the School, and is Director of the university's Plant Breeding Institute, which is at two locations; Cobbitty near Sydney, and Narrabri, in the NW cereal growing area of NSW. His research in wheat is on molecular markers, mapping of grain quality and agronomic traits, and diversity generation –TILLING and use of wild relatives. Outputs from his research (linkages and germplasm) are being used by commercial breeders. Further information is available at: [http://sydney.edu.au/agriculture/academic\\_staff/peter.sharp.php](http://sydney.edu.au/agriculture/academic_staff/peter.sharp.php)

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**Ravi Prakash Singh**

**Global Wheat Program, CIMMYT – Centro Internacional de Mejoramiento de Maíz y Trigo**  
*Role: IOC and Reviewer*



Dr. Ravi P. Singh has made highly significant contributions in the generation and application of science that has enhanced food production and security in numerous developing countries during his 33 years' scientific career at CIMMYT where he is Distinguished Scientist and leads the Wheat Improvement and Rust Research. He is also Adjunct Professor in Cornell and Kansas State Universities. Dr. Singh's research on rust epidemiology and durable resistance are widely recognized and he has contributed and led to the development of over 400 more productive, disease resistant, stress tolerant and nutritious wheat varieties released and widely grown by National program partners in many countries of Asia, Africa and Latin America. He has authored or coauthored 234 research and review articles in peer reviewed journals. Dr. Singh is also recipient of various awards and recognitions including Outstanding CGIAR Scientist Award, Crop Science Research Award by CSSA, E.C. Stakman Award by Univ. of Minnesota, and Friendship Award by the China State Council.

**Ruth Wanyera**

**Kenya Agricultural and Livestock Research Organization Njoro, Kenya**  
*Role: IOC and Reviewer*



Ruth a Principal Research Scientist at Kenya Agricultural and Livestock Research Organization Njoro. She is head of Plant Pathology and National Wheat Coordinator. Ruth has extensive research experience in wheat rust diseases, including phenotyping, surveys and surveillance. She has contributed to the release of wheat varieties with adult plant resistance to the wheat stem rust race Ug99 and its variants. She also has good background and research knowledge on sunflower, soybean and canola diseases and seed health. She has coordinated research projects funded by International, regional and national bodies. Has won a number of awards including the 2015 Borlaug Global Rust Initiative (BGRI) Gene Stewardship Award, Sydney, Australia. A mentor of a number of university students (Msc and PhD). She aspires to mentor young women scientists, contribute to improving food security in her country by sharing knowledge, experience and learning from other scientists what they have in terms of current innovations and technologies.

**Silvia Germán**

Instituto Nacional de Investigación Agropecuaria, Uruguay ([www.inia.uy](http://www.inia.uy)).  
*Role: IOC and Reviewer*



Principal Researcher at La Estanzuela Experimental Station, with main focus on wheat breeding for disease resistance, genetics of resistance and rust pathology. Works on the development of bread wheat germplasm resistant to multiple diseases, study of the basis of resistance to rusts and Fusarium Head Blight, and variation and evolution of wheat rusts.



**Simon Krattinger**

University of Zurich, Switzerland

*Role: Reviewer*

Simon Krattinger's main research interests focus on the molecular understanding of fungal disease resistance in cereals. One aim of the group consists in the development of novel approaches to rapidly isolate agriculturally important genes. In particular, the group works towards a better understanding of broad-spectrum and durable disease resistance.

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**Susanne Weber**

University of Natural Resources and Life Sciences Vienna, Austria

*Role: Symposium Secretary*

Susanne holds a master degree from the University of Natural Resources and Life Sciences Vienna. She joined the Department of Agrobiotechnology Tulln only one year ago. She is the master mind behind the organization and practical implementation of IWGS 2017.

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**Thomas S. Payne**

CIMMYT – Centro Internacional de Mejoramiento de Maíz y Trigo

*Role: Reviewer*

Tom Payne (Ph.D.) is currently in charge of the world's largest, publically available, collection of wheat and its related species, held by CIMMYT. The collection consists of over 125,000 accessions collected or donated by nearly 80 countries. He is also responsible for CIMMYT's international maize and wheat germplasm testing unit, which since the 1960's has dispatched annually hundreds of experimental varieties, free-of-charge, to public and private sector researchers globally for experimental testing and release. During the 1990's, Tom spent six years with CIMMYT based in Zimbabwe and Ethiopia, coordinating European Commission funded regional maize and wheat improvement networks, with other long-term postings in Mexico, Turkey, Syria and Yugoslavia.

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**Wolfgang Spielmeier**

CSIRO Agriculture & Food, Canberra, Australia

*Role: Reviewer*

Research interests: Molecular genetics of important traits in wheat including rust resistance, crop establishment and carbon partitioning. Major focus is on using mutagenesis to generate novel variants and next-generation sequencing technologies to identify functional mutations and genes that generate basic knowledge of mechanisms and can be used to develop accurate selection tools for the industry.

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