Dear members of the International Society for Plant Molecular Farming

This issue of our newsletter has been a bottom-up initiative from our young ISPMF members who were awarded bursaries to attend the ISPMF conference in Helsinki, 2018. They were tasked with assembling the newsletter, covering the conference talks, discussions and progress reported during the meeting, and summarizing the decisions taken during the general assembly meeting of the society.

One of those decisions was to elect me as your President!

After the 2-year presidencies, first of Prof. Julian Ma, subsequently of Prof. George Lomonosoff, it was time for someone else, again a new style and new accents but always with the same goal: coordinate and support a group of scientists whom explore new plant biotechnological approaches to produce valuable compounds for the benefit of society. Thus, it is with great pleasure that I accept the presidency of ISPMF for the coming 2 years from July 2018 till June 2020.

The society is now growing to maturity and we should consolidate and identify the niches where plant made proteins, peptides and metabolites can make a difference and be moved to products. Let us interact more and let us know your suggestions by writing to a member of the management committee!

Very kind regards, Prof. Ann Depicker

Welcome to this special newsletter for the 3rd ISPMF conference

The conference attracted 153 experts in plant molecular farming from 22 countries.

Congratulations to our new ISPMF committee members!

Ann Depicker
President

Marc-André D’Aoust
Secretary

Julian Ma
Treasurer

Kirsi-Marja Oksman-Caldentey
Society awards manager

Inga Hitzeroth and Penny Hundleby
Communications officers

Eugenio Benvenuto
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Authors: Haiou Qu, Coby Martin, Rosemary Meggersee, Jennifer Wayland, Cornelius Gunter, Hamideh Ofoghi, Sara Sukenik, Emile Rage, Kim van Noort, Shruti Bakshi, Shelley Fearon and Aleyo Chabeda.
Series editor: Georgianna Oguis
One of the issues raised during the general assembly pertained to management of the society’s funds—especially the rules governing bursaries. To shed light on this much debated topic, we surveyed this year’s bursary recipients.

1. Are you from a developing country?

- Yes: 4
- No: 5

2. Are you satisfied with the amount you received from the bursary?

- Yes: 8
- No: 1

3. Did you receive additional funding elsewhere?

- Yes: 7
- No: 2

4. Of the total cost you spent on attending the conference, what is the percentage of the amount that came from your own pocket?

- < 25%: 10
- 25% to 50%: 10
- 50% to 75%: 10
- > 75%: 10

5. This year, everyone who applied received the bursary, do you think it is fair?

- Yes: 6
- No: 3

6. Which of the following do you prefer?

A. Everyone who applies receives the same amount.
B. Not everyone who applies receives a bursary. Only a few applicants will receive an amount that is sufficient to cover both flights and accommodation.

- A: 5
- B: 4

Pre-conference trip to Suomenlinna

by Coby Martin
The University of Western Ontario

Undoubtedly, one of Finland’s most notable attractions is Suomenlinna, the fortress of Finland that is considered a UNESCO world heritage. During the first day of the conference (11th June 2018), participants of the ISPMF 2018 meeting in Helsinki, had the pleasure of visiting Suomenlinna. It is a fortress built upon six islands connected by bridges, and lies just South-East off the coast of Helsinki. Fortunately, the weather was agreeable, which made for a pleasant boat ride to the islands. This boat ride also provided an opportunity to see the city from a distance, and to observe some of Finland’s common water birds: barnacle geese, swans, and a plethora of Helsinki’s bravest gulls. The trip happened to fall within the hatching season of many of these birds, resulting in close-encounters with adorable chicks and often defensive parents. The Suomenlinna islands are dense with historical sites, and thankfully we had a knowledgeable tour guide who provided detailed explanations and amusing stories throughout our trip.

Construction of the fortress began in 1748, during the time when Finland was still part of the Kingdom of Sweden, and therefore it was originally named “Sveaborg,” which literally means the “fortress of Sweden.” When Finland obtained its independence (1917), the Finns renamed the fortress Suomenlinna, which translates to as the “Castle of Finland.” To date, the Finnish-speaking Finns refer to the fortress as Suomenlinna while the Swedish-speaking Finns refer to it as Sveaborg. Suomenlinna was constructed under the direction of Augustin Ehrensvärd, the Swedish military commander, artist, and architect. Ehrensvärd’s monument lies on the island, where he is buried. Construction of Suomenlinna was encouraged by the frequent conflicts between Russia and Sweden in the early 1700s, during which coastal areas of Finland were heavily contested. Construction and improvement of Suomenlinna continued hastily until 1757, during the time when there were more workers constructing the fortress than actual people residing in Helsinki. After the Russians conquered the fortress in 1808, they continued developments, including the construction of a large Eastern-Orthodox church and installation of cannons that still face west—supposedly to target the approaching Swedish ships. Following Finnish independence in 1917, the church became Lutheran, as it remains today.

With no modern military function, the island is now host to roughly 900 permanent residents, with a primary school and an array of charming shops, cafes, restaurants, and its own brewery. Suomenlinna also features several museums, including the only remaining Finnish submarine, Vesikko. For its wealth of historical information Suomenlinna, certainly deserves its designation as a UNESCO World Heritage Site. No trip to Helsinki is complete without a lengthy and immersive visit to this national treasure of Finland.
Opening Session

by Haiou Qu
University of Queensland

The 3rd ISPMF conference commenced with welcome speeches by Anneli Ritala-Nurmi from VTT and George Lomonossoff from John Innes Centre. As the sponsor and organiser, Dr. Ritala-Nurmi warmly welcomed all attendees to Helsinki. She also gave a quick run down of the program. Prof. Lomonossoff, the outgoing ISPMF President also welcomed the attendees. He particularly mentioned that he is very pleased to see everyone especially the new faces. He also announced bursary winners of this conference who are PhD students and early career researchers.

Following these welcome speeches, Kirsi-Marja Oksman-Caldentey, chair of organizing committee, launched a research topic articles collection for the Frontiers in Plant Science, one of the leading journals to date. The journal covers a wide area of plant science research with 19 sections including plant biotechnology, plant cell biology and plant system and synthetic biology. Dr. Oksman-Caldentey encouraged all interested attendees to talk to her about this publication issue during the conference breaks. The deadline for submitting abstract is 03/08/2018 and for manuscript is 01/12/2018.

At the end of the Opening Session, Eija Lehmuskallio gave a brief introduction to the species identifier – NatureGate. NatureGate enables people to easily find fascinating information about hundreds of wild species by searching their locations, features and behaviors. Following this, Eija also shared an enthralling video of the biodiversity of Finnish nature.

Session 1

by Rosemary Meggersee
University of Cape Town

Session 1 opened with a keynote talk from Kirsi-Marja Oksman-Caldentey, VTT (Finland) the ISPMF 2018 Organizing Committee chair. Her talk entitled “Plant biotechnology beyond genome era in the dawn of synthetic biology,” provided a brief history of plant biotechnology from ‘golden rice’ to the current cutting edge synthetic biology. She provided numerous examples of successful metabolic engineering of plant metabolites in plants. The talk was very enlightening, and she certainly set the standard for all the presentations to follow.

Franziska Keller from the Leaf Expression Systems (UK) gave a presentation on a new virus-like particle based vaccine against Rift Valley Fever (RVF). Although the data presented were obtained from preliminary experiments, the results were promising as they showed an increase in the life span of mice exposed to RVF.

Pertaining to the same theme of treating infectious diseases, Teresa Capell from the University of Lleida (Spain) presented a triple combination microbicide against HIV-1 that was expressed in rice. She provided some promising findings that showed an increase in HIV-1 neutralisation when all three microbicides were used.

Efraim Lewinsohn from the Volkani Centre (Israel) provided experimental data showing that khat (Catha edulis) leaves are able to synthesize sesquiterpenes after harvesting. They successfully characterized their sesquiterpenes and identified novel putative terpene synthase genes. The final talk of the Session 1 was by Lauri Reuter from VTT. He asked thought-provoking questions that made the audience not only ponder on what they are currently doing but also think about what they will be studying 5 to 10 years down the line. It was definitely a memorable way to end Session 1.

Session 2a

by Jennifer Wayland
University of Cape Town

Stefan Schillberg from the Fraunhofer Institute (Germany) kicked-off Session 2 by presenting the business potential for production of recombinant protein in plants, the strengths and bottlenecks. He highlighted that the way to the market for any product is a long journey that is influenced by several factors that include the expression strategy, production ease, downstream processing, production cost, toxicity studies, clinical trials and market share of the product. Throughout his talk we were reminded to always challenge our expression systems and be aware of alternative systems for the comparison of costs, downstream processing, scale, product quality and compliance with industry and regulatory standards.

Andreas Schaaf from Greenovation (Germany) then spoke about the Phase I clinical trials they conducted in 2017 for Moss-aGal, a human galactosidase developed for enzyme replacement therapy in Fabry patients. As the name suggests, Moss-aGal is expressed using Greenovations’ moss expression system: BryoMaster®. Due to the promising outcomes of the Phase I clinical trial, they are currently planning the clinical development phase for this product.
**Session 2b**

**by Cornelius Gunter**

**University of Cape Town**

Professor Kazuki Saito from the Chiba University and RIKEN (Japan) delivered the keynote talk for this session entitled “Phytochemical genomics from Arabidopsis to medicinal plants”. He asked the question how the metabolic diversity of plants originated and how can we apply this knowledge to medicine and industry? By using data-driven systems biology, we can generate hypothesis and perform reverse genetics and mathematical modelling which would lead to functional genomics and biotech applications. He also introduced their new comprehensive plant metabolomics toolbox and database (PRIME).

Hadrien Peyret from the John Innes Centre (UK) spoke about his synthetic biology approach to develop a novel, easy to use and open-access transient expression system. He successfully designed de novo synthase and 3' UTRs based on the pEAQ-HT expression vector and found maximising translational efficiency with a synthetic UTR was easier than the 3', but discovered that overexpression was led far more by the 3' UTR. He successfully designed, made and tested two new open-access expression vectors: pHRE which is nearly as good as pEAQ-HT; and pHREAC, an improved version of pEAQ-HT.

The first one was from David Craik (Australia) who talked about the small and circular molecules called cyclotides, and their applications as scaffolds for the production of peptide-based pharmaceuticals. Silvia Massa (Italy) then introduced the work they are doing on enhancing space-based farming to tackle both health and food supply issues during space missions. Liyla Kopertekh (Germany) explained how they are developing a transgenic N. benthamiana line with increased biomass production to reduce operation costs during large scale production. Rosemary Meggersee (South Africa) introduced how they used phage display to identify Human Papillomavirus scFvs that they then expressed in tobacco for use in diagnostics. Lastly, Katarina Cankar (Netherlands) ended the elevator talk session by introducing the work they did on bitter sesquiterpene lactone biosynthesis in chicory.

**Poster Sessions**

**by Hamideh Ofoghi**

**IROST, Iran**

Seventy-three (73) abstracts were accepted as poster presentations. All posters were installed in the conference hall and read during refreshments and lunch time by participants. Five posters (numbers 22, 36, 45, 47 and 50) were selected for elevator talks of 5 minutes in Session 2 of the conference.

“I am very grateful to ISPMF for the travel bursary I had been awarded to attend the 3rd ISPMF conference in Helsinki, Finland. Being exposed to the different areas of research in the biopharming community was very enlightening. I thoroughly enjoyed learning from and conversing within this scientific community.” – J. Wayland

“Reporting back on the meeting helped me focus and try and understand the take-home message each speaker wanted to convey. I am very grateful for the ISPMF travel bursary without which I would not have been able to attend this inspiring and insightful 3rd conference of the ISPMF in Helsinki, Finland.” – C. Gunter
Session 3a
by Sara Sukenik,
University of California Davis

Session 3 began with a wonderful keynote talk from Paul Christou of the University of Lleida. He discussed the development of high carotenoid transgenic maize lines, the lessons learned when moving from lab studies to field trials, and the work towards commercial applications including poultry and swine feed. Professor Christou concluded his talk by recommending a holistic approach to nutritional engineering, in which crops are modified to simultaneously accumulate multiple essential nutrients.

Next, Heribert Warzecha of the Technical University of Darmstadt (Germany) discussed engineering of cannabinoid biosynthesis in *Nicotiana benthamiana*. With the goals of steering the pathway towards defined compounds and decoupling production from THC-producing *Cannabis* plants, his group has transiently expressed late biosynthetic genes including THCA synthase and shown that active enzyme was produced.

The next talk was from Somen Nandi of the University of California Davis (USA) who introduced a NASA-funded project researching biomanufacturing on Mars to provide food and pharmaceuticals for astronauts. Aims of this project include production in lettuce of a therapeutic to combat bone loss due to low gravity and development of a purification platform using virus based immunosorbent nanoparticles.

Session 3b
by Emile Rage
ENEA Research Center

Kaewta Rattanapisit from the Chulalongkorn University (Thailand) started the second half of Session 3 with a thorough discussion on the recombinant expression of human osteopontin (hOPN) in *N. benthamiana*. She emphasized that the plant-produced hOPN has the same structure as the commercial HEK cell-produced hOPN.

The second speaker was Sara Selma Garcia from the IBMCP (Spain) who gave a presentation about the combinatorial design of modular and programmable transcriptional regulators in plants. She presented the use of CRISPR/Cas9 to create a programmable modulation of gene expression in plants. It resulted in the great potential of a Cas9/SAM (synergic activation mediator) system to modulate metabolic pathways and optimize the production of metabolites or proteins of interest.

Then Ani Barbulova (photo above) from the Arterra Bioscience (Italy) demonstrated that plant somatic embryo cultures can be a profitable source of compounds with skin rejuvenating activities. One example she gave is a product derived from *Lotus japonicus* somatic embryo extracts. Her company manufactures the extracts with skin rejuvenating properties.

Dominik Mojzita of VTT (Finland) then gave another fascinating keynote talk. He discussed development of a novel expression system which uses a synthetic transcription factor to regulate expression of a target gene. By changing the number of binding sites for the synthetic transcription factor, the target gene expression level can be modulated. A version of the synthetic expression system that was developed in tobacco was shown to also work well in yeast, demonstrating the interkingdom functionality of this system.

Julia Jansing from the RWTH Aachen University (Germany) presented the production of Hexa-mutant *N. benthamiana* plants lacking plant-specific N-glycans, using the CRISPR-Cas9 tool. She showed that she successfully obtained modified plants with fucose and xylose knock outs. She further demonstrated the potential of the platform for the production of an antibody with a humanized glycosylation.

Joachim Schiemann from JKI (Germany) delivered the final keynote and gave an overview of genome editing and an in-depth discussion on the challenges we face in defining a genetically modified organism. He also acquainted us with the current GMO regulatory systems and the different interpretations and the existing rules around the world.

The second day ended with the presentation of three new projects from H2020 in molecular farming. Diego Orzaez introduced us to Newcotiana, Dirk Bosch talked about CHIC and Julian Ma discussed PharmaFactory.
Get-together
by Hamideh Ofoghi
IROST, Iran

Following Session 1 on the 11th of June, all participants were invited to the Helsinki Old Town Hall, Empire Room, for a welcome reception ceremony. Anni Sinnemäki, the Deputy Mayor of Helsinki warmly welcomed everyone to the City. After, the participants were serenaded with traditional songs performed by a choir Villimarjat from Helsinki. Later several group photos were taken and the get-together continued with a delicious savoury reception.

Session 4a
by Kim van Noort
Wageningen University

Marc-Andre D’Aoust from the Medicago (Canada) opened Session 4, with a keynote talk about the development of the next generation influenza vaccine. This year’s flu shot was less than 20% effective for the most common strain of this season; hence, better vaccines need to be developed. One of the products in the pipeline of Medicago is a virus-like particle (VLP) vaccine created by transient expression of major influenza surface antigen, Hemagglutinin. Tests for this vaccine showed an enhanced delivery to the lymph nodes and powerful activation of antigen present cells. Clinical phase 2 trials showed promising results with the same safety measures and antibody responses, but higher cell-mediated immune responses compared to licensed vaccines. The phase 3 efficacy study was then initiated. This was through a randomized observer-blind placebo-controlled multicenter study in 10,000 adult patients from seven countries. At the moment they are collecting the data, and the preliminary results are expected to come out this fall.

The second talk of this session was from Sebastian Mercox from Catholic University of Louvain (Belgium) who gave a talk about his achievements in genome editing of Nicotiana tabacum suspension cells by a multiplex CRISPR/Cas9 strategy resulting in humanized pharmaceutical glycoproteins. Glycosylation in plants and mammals differ. In order to produce mammalian glycoproteins in plants, the plant glycosylation pathway needs to be “humanized”. To achieve humanization of the plant Golgi pathway, 2 Xylosyltransferases (XylTs) and 4 Fusosyltransferases (FucTs) were knocked-out by CRISPR-Cas9 via multiplex genome editing. For a XylT and FucT knock-out plant, 3 and 9 sgRNAs were combined respectively, in a tRNA-processing system. After transformation, secreted proteins by 10 out of 28 obtained transgenic lines were analyzed by Western blot. Two (2) lines showed absence of β1,2 xylose and α1,3 core fucose, which was confirmed by mass spectrometry. Sequencing results showed small INDEL’s and deletions between the target sites. Furthermore, production of human IgG2 in these BY-2 XylT/FucT KO lines resulted in IgG2 without plant specific glycans.

After extensively learning about vaccine production and genome editing, Ingo Appelhagen from the John Innes Centre (UK) steered us to a different topic where he introduced a new product from plant cell cultures: anthocyanins. Anthocyanins are pigments which are not only used as fine chemicals in analytical standard and biomedical applications, but also as natural colorants in food and cosmetics. At the moment, anthocyanins can be made in yeast and E. coli. However, these bacteria do not have the pathway for anthocyanin production, so 11 to 20 different genes need to be introduced depending on the color of the anthocyanin. Whereas, in plant cultures this is not necessary. If plant calli do not contain anthocyanins, the pathway is induced by the transcription factors WD40, MYB and bHLH. This results in production of 300mg/L cy3R in plant cells, whereas E. coli produces only 10mg/L pel3G and yeast 5mg/L pel3G.

Last of this Session before the break was a talk by Philippe Varennes-Jutras about the pH gradient mitigation in the leaf cell secretory pathway. Acidic pH can affect recombinant protein maturation and stability. The pH within the Golgi is regulated by the Matrix-2 (M2) ion channel. Co-expression of M2 triggers pH increase in the Golgi and can therefore increase the yield and quality of recombinant proteins, like Hemagglutinins. However, the pH can also affect the protease activity of the host and its cell-wide proteome. Philippe showed that protein proteolysis is pH dependent and that co-expression with M2 alters the proteome of agroinfiltrated leaves. In comparison to an EV infiltrated plant, M2 downregulates defense-related proteins, so M2 expression attenuates the plant response to agroinfiltration. At the moment he is working on the identification of the proteases affected by M2 and he tries to address the questions related to plant immunity.
Session 4b
by Shruti Bakshi
VIB, Ghent University

Frank Petersen from the Novartis (Switzerland) shed light on the industrial aspects of drug discovery based on natural products. He said that plants can be a source for developing new therapeutics. For instance, artemisinin, which has a great potential in malaria treatment, is being produced in Chinese farms to obtain a large quantity. The company produces Artemisinin under the trade name Coartem®/Riamet®. This drug contains the fixed 1:6 ratio combination of Artemether and Lumefantrine. Another aspect of his talk focused on renal cell carcinoma (RCC) which accounts for 3% of cancers in adults. Activation of mTOR (mammalian target of rapamycin) signaling pathway is the major cause of increased cell growth and metabolism. Therefore, deregulation of this pathway is implicated in number of diseases including cancers. Afinitor®, marketed by Novartis, is an inhibitor of mTOR, which receives approval for second line treatment in renal cell carcinoma in 2009. Novartis has been receiving approvals for pancreatic and renal cell carcinoma followed by breast cancer indications and others since 2011 and 2012.

Audrey Teh from St. George’s University, London (UK) presented her work on improving effector function of HIV antibodies by improving binding to Fc receptor. Thus, they have generated antibodies with DE mutation in the Fc tail in order to determine whether this mutation improves FcγRIII binding or not. SPR measurement shows improved binding by more than 2 logs. However, DE mutation decreases the yield of bnAb (broadly neutralizing antibodies). DE mutation had no impact on other functions e.g. HIV neutralization. In the future, they plan to further evaluate the mutant anti-bodies in CDC (complement dependent cytotoxicity) assay.

Next speaker in this Session was David Ullish from Phytion Biotech GmbH (Germany). He talked about production and evaluation of secondary metabolites using plant cell cultures. He presented how MVDA (multivariate data analysis) can be used for titer improvement and gathering of future process information. He demonstrated that Phytion’s route for paclitaxel extraction from plant cell culture is better than extraction from other sources because it does not require any hazardous solvents and can be cryopreserved to provide unlimited supply.

Rima Menassa from Agriculture and Agri-Food Canada gave an insightful talk as her group has been focusing on developing IgA based therapeutics against Shiga toxin-producing E. coli infections. She demonstrated the production of VHH fused to rationally designed IgA Fc in order to improve protein accumulation, thermostability and solubility. The Fc mutation was based on bioinformatic analysis and molecular modeling. She showed in her presentation that Fc tail mutation which improves accumulation of VHH-Fc fusion, does not affect the efficacy of the fusion antibody.

Session 5a
by Shelley Fearon
University of Cape Town

Session 5 began with an interesting keynote presentation by Jennifer Bromley from the British American Tobacco (UK) which focused on identifying the genes involved in the nicotinic alkaloid biosynthesis pathways of N. tabacum to improve tobacco products and its use in molecular farming. Jennifer reported on their recently published work, an improved genome assembly for N. tabacum which was produced by combining low and high-resolution data using optical mapping and next generation sequencing respectively. In conjunction with this reference genome, transcriptomics and metabolomics datasets were integrated to locate candidate genes involved in nicotinic alkaloid biosynthesis. The second speaker, Benjamin Gengenbach from Fraunhofer IME (Germany), presented his research on the production of the anti-cancer carbohydrate-binding toxic lectin viscum in N. benthamiana plants and N. tabacum plant cell-packs (PCPs). His research demonstrated that the transient expression of the full length viscum gene achieved greater A-chain yields in both PCPs and intact plants when compared to single and co-expression of constructs encoding the separate A and B chains. In addition, when compared to E. coli production systems, plant derived viscum resulted in decreased production costs and an increase in toxicity when using THP-1 cell lines.

Next, Anatoli Giritch from the Nomad Bioscience (Germany) presented a promising antimicrobial approach to combat various foodborne bacterial infections by using bacteriocins and phage endolysins. Bacteriocins from E. coli (colM, colB, colK and colU), Salmonella (SalEsa and SalEsb) and Clostridium bacteriophage lysins (Psm endolysin) were produced using plant-virus-based production systems and purified by means of column chromatography. These separate cocktails were shown to efficiently reduce the titer of pathogenic bacteria in food produce infected with pathogenic E. coli, Salmonella enterica and Clostridium perfringens.

Mark Jackson from the University of Queensland (Australia) presented his research on increasing the yield of cyclotides, a plant defense molecule used to stabilize and increase the potency of therapeutic peptides. His research showed that cyclisation of kB1 only occurred after the transient co-expression of asparaginyl endopeptidase (AEP) and the Oak1 gene (encoding the precursor protein of cyclic kB1). Demonstrating that AEPs may be a promising means to boost cyclic peptide yield.
Session 5b
by Aleyo Chabeda
University of Cape Town

Muriel Bardor from the University of Rouen (France) presented the first of the four final talks of Session 5. Her research group focuses on the functional properties of plant glycomolecules and the biosynthesis of glycoproteins. In her presentation entitled “Understanding the regulation of the N-glycosylation pathway is a prerequisite to optimize microalgae as a cell factory for the production of biopharmaceuticals”, she showed data on the characterization of the N-glycosylation pathway for *Chlamydomonas reinhardtii* using *N*-acetyl glucosaminyl-transferase I (GnT1) from *Arabidopsis* and *Phaeodactylum*. In her talk, she described previously uncharacterised methyltransferases and tackled the use of xylooltransferases to alter the *N*-glycosylation pathway of *C. reinhardtii*.

George Lomonossoff from the John Innes Centre (UK) then gave the second talk where he thoroughly discussed a vaccine candidate for Nervous Necrosis Virus (NNV), a nodovirus that infects more than 40 marine fish species. This virus poses a threat to global food security due to the mass mortality it causes in economically important fish species. NNV virus-like particles (VLPs) produced by transient expression in tobacco showed a degree of protection in vaccinated and subsequently challenged sea bass. This vaccine candidate shows promise for use in aquaculture.

Staying on the theme of VLP vaccine candidates, Ann Meyers from the University of Cape Town (South Africa) presented data on the immunogenicity of a VLP vaccine against African horse sickness caused by African horse sickness virus (AHSV). Transient expression of AHSV VP2, VP3, VP5 and VP7 structural proteins produced VLPs and immunogenicity studies in horses showed the presence of neutralising antibodies against AHSV serotypes 5 and 8, which were similar to titres observed in horses immunised with the live attenuated vaccine currently used. These results show great potential for an AHSV VLP vaccine produced in plants. The next step is to conduct challenge experiments to determine the protective efficacy of these candidate vaccines.

Lastly, Luis Matías Hernández from the company Sequentia Biotech (Spain) gave the closing conference presentation. He described the use of trichomes as biofactories and thoroughly discussed the success of using Tricopharming technology in the production of artemisinin, a molecule used to treat malaria. He also presented details on Artennua, the first product from their research company. He emphasized that Artennua is not only a promising candidate to treat malaria, but also a potential therapeutic to treat cancer, autoimmune and inflammatory diseases, and dermatological disorders.

Closing ceremony and conference dinner
by Haiou Qu
University of Queensland

After five sessions of great talks and interesting posters, the 3rd ISPMF conference closed on the 13th of June. Prof. Oksman-Caldentey gave a thank-you speech to all the organisers and volunteers of the conference. Flowers and a small gift were given to each of them to thank them for their hard work and thoughtful service. Prof. Lomonossoff also gave his last talk as the president of ISPMF. He congratulated everyone for the success of this conference. Dr Benvenuto volunteered to host the 4th ISPMF conference which will be held in Rome in 2020. He invited everyone to attend next ISPMF conference to have another nice get-together meeting.
Recent Publications:

This newsletter features a new section for recent publications in Molecular Farming. All society members are welcome to send in their recent publications (last 6 months) for inclusion. You may include anything that has been accepted for publication. Please send details to Inga Hitzeroth - inga.hitzeroth@uct.ac.za or Penny Hundleby - penny.hundleby@jic.ac.uk. Please use the standard format, which is that used by the Proceedings of the National Academy of Sciences.

From Julian Ma:


From Joachim Schiemann:


From George Lomonossoff:


From Penny Hundleby:

From Inga Hitzeroth


From Medicago


IF YOU HAVE PUBLISHED RECENTLY WHY NOT LET US KNOW. RAISING AWARENESS OF PUBLICATIONS BETWEEN MEMBERS HELPS PROMOTE WORK...AND INCREASES CITATIONS!

The Power of Networking!
Promotional offer: The recently published book below includes contributions from many ISPMF members and as such maybe of general interest to all members. The table of contents and access to chapter abstracts can be found here.

Description
A single volume collection that surveys the exciting field of plant-made pharmaceuticals and industrial proteins.

This comprehensive book communicates the recent advances and exciting potential for the expanding area of plant biotechnology and is divided into six sections. The first three sections look at the current status of the field, and advances in plant platforms and strategies for improving yields, downstream processing, and controlling post-translational modifications of plant-made recombinant proteins. Section four reviews high-value industrial and pharmacological proteins that are successfully being produced in established and emerging plant platforms. The fifth section looks at regulatory challenges facing the expansion of the field. The final section turns its focus towards small molecule therapeutics, drug screening, plant specialized metabolites, and plants as model organisms to study human disease processes.

ISPMF Members can claim a 20% discount via https://bit.ly/2LXJ51C quoting ISP20 at the checkout before 30th June 2019
Upcoming meetings:

**International Association for Plant Biotechnology Congress: 19th -24th August 2018, Dublin Ireland.** Covering the latest innovations in precision breeding, in vitro culture and morphogenesis, food security, plant nutriomics, biopharmaceuticals, roots and tubers, and many more.

Please note that **bursary opportunities** may be considered for ISPMF members wishing to attend conferences – not specifically aimed at molecular farming, where justification for attending and/or promoting the society can be made. For further details please contact Kirsi-Marja Oksman-Caldentey ([who now overseas our Bursary awards](mailto:kirsi-marja.oksman-caldentey@psb.ugent.be)).

The figure above represents the tumor-inducing Ti plasmid in an electron microscopy moon raised among old buildings photographed during the Ghent light festival.

The “Agrobacterium 2018” symposium is a joint event of the **39th American Crown Gall meeting** and the **2nd European Agrobacterium conference** that will be hosted by the VIB institute and Ghent University in Ghent, Belgium on the 12th and the 13th of September 2018.

For further details visit: [www.psb.ugent.be/agro](http://www.psb.ugent.be/agro)

The “Agrobacterium 2018” symposium should present timely perspectives of the cell biology of Agrobacterium, on Agrobacterium as a pathogen (ecology, diversity, treatment), on horizontal gene transfer between bacteria and eukaryotic cells, on plant responses upon Agrobacterium infection, and on the use of Agrobacterium as an essential tool in plant biological sciences and crop genome editing.
We hope you have enjoyed this special issue of our society newsletter. A special thank you to all contributors. Contributing to the society newsletter is a great way of gaining experience, raising your profile and supporting the ISPMF community.

If you would like to contribute to the next ISPMF newsletter:
- To share your news with the ISPMF community
- Write an article or review
- Advertise a meeting
- Promote your research

We welcome and encourage contributions from all members.
Please email us using the header ‘ISPMF news’