Just as the industrial world has claimed its fourth phase of evolution (Industry 4.0*), the Young Scientists Symposium was in its fourth form of reincarnation during October at Ghent in Belgium.

Six years since its inception in 2008 the Young Scientists Symposium (YSS) has gone from strength to strength in terms of participation numbers, total attendees, diversity of attendees and the quality of research. KU Leuven had the esteemed role of organising and running the fourth YSS. The University set the tone for what was to be an intense but enjoyable three days in the city of Ghent. One could not help but feel the enthusiasm and energy that they had put into this event; by all measures managing to exceed the expectations of all attending. This was never more poignant than in the choice of the ‘Godfather of German Brewing’, Professor Ludwig Narziss (TU München – Weihenstephan), as the keynote speaker for the symposium.

A wide variety of topics were covered at the symposium, with the sessions covering:
- Process innovations in malting and brewing – chaired by Rudolf Michel
- Raw materials for brewing and distilling – chaired by Paul Hughes
- Yeast technology and innovations in fermentations – chaired by Dirk Iserentant and David Cook
- Novel analytical methods for raw materials and beverages – chaired by Joeri Vercammen
- Microbiology and hygiene – chaired by Luc De Cooman
- Experimental design, measurement and uncertainties – chaired by Jan Van Impe
- Flavour and sensory properties of food beverages – chaired by Filip Van Opstael
- Poster discussions – chaired by Guido Aerts

It is not possible to discuss all of the posters and presentations, but as Professor Narziss stated in his closing address, the quality of the academia and research put forward was world class. It is always reassuring to find out how much we do not know or understand in the world of brewing and even after many years in the industry Professor Narziss stated that there is still a great deal to be discovered. The following are some of my own highlights of the conference:

Wort boiling by PDX
In larger-scale breweries there would appear to be a trend towards turning away from the more traditional boiling systems. While not necessarily new, the ‘simmer and strip’ method is becoming more focused upon by many breweries.

Calum Holmes (University of Nottingham) presented his findings on the Pursuit Dynamics (PDX) wort heater. Calum highlighted that over recent decades there has been an increase in fossil-fuel prices which in turn has pushed the brewing industry to develop novel and energy-efficient technologies.

His trial compared an external wort boiling system with that of the PDX culinary-grade steam-injection system. He found that there was no net reduction in evaporation across the boil, although the system proved to be slightly inferior when stripping volatiles. However, ultimately when compared with the external boiler the beer was found to be “brand appropriate”. There would, for some, appear to be a trade-off between being able to meet your desired wort
New yeasts from old
Stijn Mertens (KU Leuven/VIB) put forward research on developing new lager yeasts to look for aromatic diversity. According to Stijn, the current most popular lager strain Saccharomyces pastorianus is assumed to be from a hybridisation in the 15th or 16th century of Saccharomyces cerevisiae and Saccharomyces eubayanus. Essentially going back in time, Stijn bred new strains of lager yeast by cross-breeding S.cerevisiae with S.eubayanus, S.kudriavzevii and S.mikatae. This produced 250 new and unique lager strains, a few of which were selected for genetic stabilisation and further screening for fermentation potential. Needless to say, with the wide variety of new strains came a wide diversity in aroma profiles produced by the yeast. Smaller brewers are constantly looking at new yeast strains and forming ‘house’ strains, so this research is sure to tickle the fancy of a few craft brewers.

Barley variety and beer gluten
In a category which is gaining increasing importance in the brewing sector, Joshua Taylor (University College Cork) showed that there can be significant inter-varietal difference between barley in terms of gluten levels. Therefore, an important factor when designing a gluten-free beer recipe should be the choice of barley, as it can lower levels by significant amounts. From the results, Joshua showed that in Ireland, Overture barley was able to produce beer with a level of approximately 20ppm while varieties such as Propino were around 140ppm. Many countries around the world would regard a level below 20ppm to be considered a gluten-free beer.

Custom packaging on demand
What must be an undeniable fact is that the brewery you work at, or one close to you (whether large or small), has been contacted in the last six months with a request for a specialised personal label (this is regardless of creating a unique beer for them). Restaurants, companies and even individuals are looking to personalise their own products. Romy Eichler (TU München) presented some very interesting innovations being made by manufacturers and intelligent system designers. Key to the success of the system is allowing “decentralised production control…which provides a decentralised communication between all intelligent machines of the filling and labelling technology as well as the components of the transport system and the industrial robot (sic), which move the bottle through production.”

The dynamic process would allow customisation in terms of a choice of bottle, cap, label and beer. All of which has the potential to be scaleable down to an individual bottle run – although economics is likely to be a key factor in run sizes. The concept is that a customer may simply go to a website or application and select the inputs they desire and create their own personalised brand. The attraction for such a system is obvious in terms of those aforementioned.

Flavour influenced by label
A poster by Hannah Lemar and Barnaby Hoare (Campden BRI) provided an interesting insight into the influence of flavour descriptors used on bottles. Their project showed that: “due to their subjective nature, flavour descriptors on beer labels are not misleading, but do considerably influence flavours perceived.” The study demonstrated that even a trained expert beer sensory panel is heavily influenced by labelling descriptors, and/or that the descriptors used for beer labels may not be the most accurate and accessible description of the product. If an expert panel is unable to identify the descriptors provided on the label in the product during a blind tasting, then it is also likely that the average consumer will not. For one sample, the attribute ‘pepper’ increased from 0/19 to 12/19 selections as a result of only descriptors used on the label. The study showed that: “due to their subjective nature, labelling descriptors, and/or that the descriptors used for beer labels may not be the most accurate and accessible description of the product. If an expert panel is unable to identify the descriptors provided on the label in the product during a blind tasting, then it is also likely that the average consumer will not. For one sample, the attribute ‘pepper’ increased from 0/19 to 12/19 selections as a result of only labels used on the label. Their project showed that: “due to their subjective nature, labelling descriptors, and/or that the descriptors used for beer labels may not be the most accurate and accessible description of the product. If an expert panel is unable to identify the descriptors provided on the label in the product during a blind tasting, then it is also likely that the average consumer will not. For one sample, the attribute ‘pepper’ increased from 0/19 to 12/19 selections as a result of only descriptors used on the label. The study showed that: “due to their subjective nature, labelling descriptors, and/or that the descriptors used for beer labels may not be the most accurate and accessible description of the product. If an expert panel is unable to identify the descriptors provided on the label in the product during a blind tasting, then it is also likely that the average consumer will not. For one sample, the attribute ‘pepper’ increased from 0/19 to 12/19 selections as a result of only descriptors used on the label.
and small. Daniel Vollmer (Oregon State University) provided some food for thought on the oxidation of Hallertauer Mittlefruh hops. Lager was dry hopped with both fresh and oxidised forms and presented for a comparison to 60 consumers. The results found no significant difference in overall preference between the two. However, trained panelists found the oxidised sample to contain a more fruity and hoppy aroma, with lower levels of myrcene. Therefore, the implications of this is that Grant’s findings may potentially have implications for those who produce cask beer. Many brewers still use a minimal dry hopping process in the cask to impart a ‘hoppy aroma’, carried out during an active secondary fermentation in the cask. Grant’s observations that myrcene tends to disappear quite significantly in comparison to other terpenes during an active fermentation is likely to have an impact on those brewers trying to dry hop with high myrcene level hops (US Cascade, Amarillo and Citra) in an attempt to impart a dominant myrcene aroma.

It is certainly well-established for UK brewers to dry hop in cask. However, English hop varieties, even UK-grown Cascade, have lower levels of myrcene. Therefore, the aroma they are imparting is generally not that of myrcene but other terpenes and sesquiterpenes. The implications of this is that Grant’s findings may have consequences for those using non-traditional English hops who are trying to impart myrcene flavours in a cask beer, as they may just be wasting their time and money on comparatively expensive hops.

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On the road

One of the highlights of the symposium was a visit to the Rodenbach Brewery in the nearby town of Roeselare. The visit to such a unique and historic brewery paved the way for a steep learning curve for some in terms of what a beer ‘should’ taste like. The mixture of old and new technology proves that it is possible for a brewery to embody both tradition and innovation while maintaining what only can be described as a ‘soul’ to the brewery.

The underpinning ideology of what the symposium provides is a platform for young scientists to gain exposure in presenting their scientific research to a diverse audience of their academic peers and industry professionals. The event allows the expression and exchange of knowledge and ideas, which for young academics and professionals is a significant part of their development. The other facet of the symposium for young scientists is the networking opportunities and lifelong friendships that can be formed at such an event. These relationships can only help in terms of personal, professional and academic development.

The final day of the symposium saw several key announcements made. These were the winners of the best presentation and posters, and of course the curators and location of the next YSS. In their respective order, the winner of the best presentation was by Jeroen Baert (KU Leuven) for his presentation on the topic of bound-state aldehydes, while the winner of the best poster presentation was by Jana Gierds (VLB Berlin) for her poster on the topic of identifying brewers’ yeast strains.

It was then announced that the next YSS is to be organised by the University of California Davis and will be held at the Sierra Nevada Brewery in Chico, California. On behalf of the IBD I would once again like to thank all those who attended the YSS in Ghent. A special thankyou to Guido Aerts and his team at KU Leuven for putting on a fantastic symposium, and last but not least I look forward to seeing everyone at the next instalment of YSS in 2016.