

Rheology Division Connects Scientists from Across the Globe in Ghent

CLYDE DON AND MARTIN G. SCANLON

The motto of the American Institute of Physics Society of Rheology is “everything flows.” In mid-April, this was certainly true for the rocks under Eyjafjallajökull on the boundary of the North American and Eurasian tectonic plates. Just one week prior to the AACC International Rheology Division short course, and it appeared that the ash cloud accompanying the flowing rocks would prevent travel not only between the two tectonic plates but even within western Europe. Despite these concerns, a day or two later, the ash dispersed with the other clouds, and attendees and speakers were greeted with three beautiful spring days alongside the rheostatic river Leie in the vibrant Belgian city of Ghent.

Location, Location, Location

One goal for the Rheology Division is the exchange of knowledge, both basic and contemporary, on the rheology of cereal-based systems. One mechanism in achieving this goal is the rheology short course. Attempts to offer such a course in North America had been unsuccessful of late. After an informal survey among potentially interested parties, it appeared that a “renewed rheology short course” had the best chance of succeeding if it was

“... a good combination of basic science and practical application.”

offered in Europe. One important reason was that universities and industrial research labs are quite densely situated; hence, travel is less of a problem (unless the whole region becomes one big no-fly zone). Two things were needed to make the short course offering, Rheology and Structure of Cereal Based Foods, a reality—a



Speakers and attendees enjoy a health break in Het Pand.



Instrument capabilities are demonstrated to attendees.

conference facility centrally located so that it was accessible to all and sponsors with an interest in the rheology of cereal systems, so that registration costs were attractive to students and researchers alike.

The Rheology Division was fortunate to have the active support of Koen Dewettinck of the Department of Food Safety and Food Quality at the University of Ghent (UG), Belgium. Dewettinck was able to convince the university that rheology is an important determinant of food quality. He was also able to convince his Ph.D. student, Filip van Bockstaele (a past recipient of the Isydore Hlynka Best Student Paper Award), that organizational skills are best acquired through experience!

The short course itself took place in Het Pand, a modern conference facility with a long history. Situated next to the little Chapel of Sint-Michiels, it was originally established as a hospital in 1201. However, by 1228, the building was already too small and the hospital was moved. The empty building was given to the Dominicans and used as a monastery. A few centuries later, the monastery became the property of UG, and after some reconstruction, it became the university’s conference venue—the perfect spot for the first European version of the rheology short course.

Platinum, Silver, and Bronze

The benevolence of industrial sponsors is critical to the success of many educational programs; industrial issues inspire sound fundamental scientific studies, and these fundamental studies are a source of further industrial innovation. For CSM, the short course’s platinum sponsor, rheology is a phenomenon to be altered and manipulated by judicious selection from a suite of ingredients. For Anton Paar, our silver sponsor, rheology is a phenomenon to be measured with accuracy, utilizing a range of instrumentation and fixtures. For the bronze sponsors, Brabender, Chopin SA, and Stable Micro Systems, the complex rheology

of cereal systems demands targeted approaches; rheological measurements provide insights into flour quality and ingredient efficacy and, in this way, we can predict their effects on product end-use quality.

The Rheology Division commends all sponsors for their support of the short course through sponsorship and table-top exhibits for two reasons. First, the sponsorship allowed us to offer the short course at a reasonably low price, providing many graduate students the opportunity to participate. Today's students are tomorrow's research leaders and industry captains, and courses



The river Leie, Ghent

such as these help shape research directions and thus career paths. Second, the sponsors' active participation was a vital component of the short course. From course attendee feedback, it was clear that an appreciation of the capabilities of testing instrumentation is an important element of a rheology short course.

A Good Mix of Academia, Industry, and Nationalities

Although it was expected that the course would primarily attract young researchers and graduate students, there was also a significant proportion of more experienced industrial researchers, eager to learn more about recent developments in rheology and how this knowledge could be exploited in novel processing strategies. Of the 31 course participants, 55% were industry affiliates and 45% were university/institute affiliates. More than 10 nationalities were present, from the far north (Sweden) to the south (Italy), and a number of European nations in between.

Four nationalities were represented in the speakers. Dewettinck started off by providing a fundamental overview of rheological concepts and rheological testing. van Bockstaele, UG, continued with an up-to-date exposition of how fundamental and empirical tests on dough permit us to probe the intimate connection between rheology and microstructure. Further evidence of this was gleaned from Clyde Don, Foodphysica, the Netherlands, and his discussion on how the complex supermolecular structure of gluten governs dough rheology, and thus the dough's baking performance. A wonderful demonstration of how knowledge of dough structure can be exploited so that different dough-mixing techniques bring about very different product outcomes was given by Atze Jan van der Goot, Wageningen University, the Netherlands.

A Stable Micro Systems ad appeared here in the printed version of the journal.

A novel twist on this understanding was neatly expounded on by Lieke van Riemsdijk, one of van der Goot's Ph.D. students, who showed how shear processing allows a totally new approach to the development of gluten-free bread products. In all these talks, loaf volume was a familiar phrase, and so the last two speakers, Martin Whitworth, CCFRA, England, and Scanlon, University of Manitoba, reminded us of Grant Campbell's dictum that "bread-making can be viewed as a series of aeration stages"—investigations of dough rheology cannot be separated from understanding how bubble structure in doughs and batters affects the rheology and quality of the breads and cakes that they are transformed into. Whitworth also reminded us that, for some products, when a large amount of fat and sugar is present, the cereal base may be just 50% (or less) of the formulation, and so we demand a lot from the functionality of the flour. A good practical demonstration of this interplay between formulation complexity, processing steps, and rheology was evident during the short excursion to the Vondelmolen Ginger Bread manufacturing plant.

"I have been inspired to continue our work."

Time-Dependent Behavior

Although course participants did see room for improvement in some features of course content and course logistics, the predominant response was that expectations were met well. The success of the course is therefore an incentive for future rheology and structure offerings, perhaps alternating between North America and Europe, and varying course content to meet differing demands from students and industrial researchers. In addition, based on feedback from attendees, the Rheology Division sees opportunities for future multidisciplinary offerings with other divisions of AACC Intl. such as a) rheology of cereal starches (dilute and concentrated); b) online/at-line/close-to-the-line rheological/physical methods; c) AACC Intl. Approved Physical Testing Methods: their use and what they tell us about product quality; and d) how rheology can help in reformulation strategies (low sugar, low fat, more fibre) when it is critical not to jeopardize the desired structural features of the product.

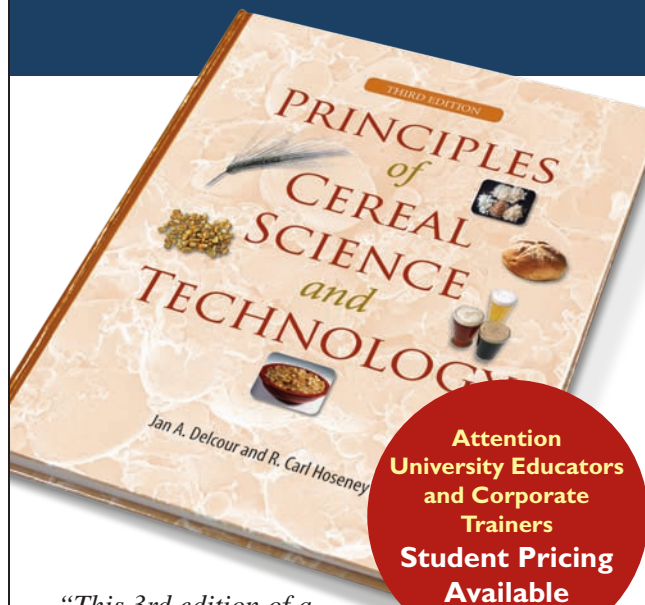
Conclusions

Satisfying the disparate rheological needs of cereal scientists across the globe is not an easy task. Nevertheless, course offerings that elucidate relationships among process, structure, and properties appear to be well received and will continue to be a focus of the Rheology Division.

Clyde Don, vice chair of the AACC Intl. Rheology Division, chair of the Protein Committee, and a member of the Physical Testing Methods Committee, founded Foodphysica in 2009. Foodphysica's mission is to bridge the gap between science and industrial application. Don, who received a B.S. degree in polymer science, an M.S. degree in chemical engineering, and a Ph.D. degree in food science, has nearly two decades of experience in food, agrotechnology, and (bio)polymers. He is also a member of the AACC Intl. Protein Technical Committee. Don can be reached at clyde.don@foodphysica.com.

Martin G. Scanlon, chair of the AACC Intl. Rheology Division, is a professor and currently acting head in the Department of Food Science at the University of Manitoba. His research and teaching focuses on how processing affects the mechanical properties, structure, and texture of foods. He was a coeditor of the AACC Intl. PRESS title, *Bubbles in Food 2: Novelty, Health, and Luxury*. Scanlon is also chair of the AACC Intl. Canadian Prairie Section and a member of the AACC Intl. Publications Panel-Book Acquisitions. He can be reached at scanlon@cc.umanitoba.ca.

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