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Paper Physics: Transforming the art of papermaking into a science

In the November Special Paper Physics issue of *TAPPI Journal*, we celebrate the contributions of the international paper physics community by publishing some of the many excellent papers originally submitted for the Progress in Paper Physics Seminar, which was held in Graz, Austria, in September 2011. The Seminar, held once every two years, is intended to showcase ongoing research between the more formal Fundamental Research Symposia held in Oxford and Cambridge, UK, and the International Paper Physics Conferences, which are held every four years. The papers selected by the *TAPPI Journal* editorial committee have been peer reviewed by renowned researchers prior to publication as peer reviewed papers. Some additional papers from the Seminar will be published in future issues of *TAPPI Journal*.

Joining *TAPPI Journal's* editorial staff for this issue as guest co-editor is Dr. D. Steven Keller (kellerds@muohio.edu), associate professor in the Chemical and Paper Engineering Department at Miami University in Oxford, OH, USA. Steve coordinated the manuscript submission with Dr. Ulrich Hirn, assistant professor at Graz University of Technology and program secretary for the Seminar, and arranged for the selected papers to be reviewed. Dr. Wolfgang Bauer (professor and head of the Institute for Paper, Pulp and Fibre Technology at Graz University of Technology) was chairman of this very successful Seminar.

Papermaking evolved from art to science over many centuries. For more than fifty years, the international paper physics community has been instrumental in replacing the mysteries of the art with a rigorous scientific understanding of how things work at the level of individual fibers, the structure formed in paper and board, and ultimately the behavior and properties observed during processing and in the final products.

Paper physicists use techniques ranging from traditional handsheet making and first principles analytical techniques to simulation, microscopy, and many others. While advancing knowledge in the fields of chemistry, engineering, and many other disciplines have profoundly impacted how paper is made, the paper physicists have shown us how fiber interactions develop the

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strength, flexibility, absorptivity, and optical properties that are unique to paper products.

One paper in this month's issue reminds us that basic data can be interpreted in many ways. Just as Derek Page incorporated the data from prior publications by Ingmanson and Thode in his classic 1969 "Page equation" paper, Gerry Ring has cast a new analysis of that data and results from other sources to justify a completely different approach for the interpretation of paper strength. No theory is fully accepted without surviving long term peer scrutiny, challenging debate, and verification of the work. We will eagerly await the response to Gerry's work.

This month's issue also presents the results from a simulation of the early stages of paper formation by Mark and others in Sweden and Germany. Arthur and colleagues from SUNY-College of Environmental Science and Forestry offer details about interesting microscopic visualization techniques to look at paper pore structure and provide a clearer understanding

of ink penetration. Krochak and Thompsson at Innventia AB in Sweden show results of a new technique for quantifying the degree of mixing in fibrous suspensions that does not require an optically transparent suspension. We may see this technique in use sooner rather than later.

Those interested in the ongoing exploration of the fundamentals of paper, papermaking, and the underlying physical processes that explain the observed behavior are encouraged to attend the upcoming 2012 International Paper Physics meeting, to be held in June 2012 in Stockholm. The conference is co-sponsored by TAPPI and PAPTAC and organized by Innventia and KTH in Sweden. The conference is to be held in conjunction with the 8th International Paper and Coating Chemistry Symposium, which will showcase the latest from the fundamental chemical and nanosciences as applied to the papermaking process and paper products. The organizers have promised to weave the interests of both scientific disciplines into the program. The

next Fundamental Research Symposium will be held in September 2013 at the Robinson College at Cambridge, UK, and is a premier technical conference for paper scientists. The 2014 Progress in Paper Physics Symposium will be hosted by North Carolina State University in Raleigh, NC, USA.

We would like to once again thank all the authors and reviewers for their timely efforts in reviewing and revising these paper physics submissions on a very short time line, and also remind all submitters that it takes a minimum of two peer reviews to get your paper published in *TAPPI Journal*. Please be supportive of the publication efforts of others by agreeing to provide peer reviews when asked, as you would want others to respond on behalf of your submissions. **TJ**

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