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Professor Franz-Josef Ulm

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Ulm and Concrete Sustainability Hub named to list of top newsmakers

Research on reduction of concrete's environmental footprint prompts inclusion on trade journal's list.

Denise Brehm | Civil and Environmental Engineering
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Engineering News Record, a weekly magazine for the construction industry, has named Franz-Josef Ulm, the George Macomber Professor in the Department of Civil and Environmental Engineering (CEE), to its list of "25 Top Newsmakers" for his work establishing the MIT Concrete Sustainability Hub (CSH).

The hub, which is headquartered in CEE, was established October 2009 with \$10 million in funding from the Portland Cement Association (PCA) and Ready Mixed Concrete (RMC) Research & Education Foundation. The objective of the CSH is to reduce the environmental footprint of concrete — the manufacturing of which is responsible for about 5 percent of global atmospheric carbon dioxide — by accelerating emerging breakthroughs in concrete science and engineering and transferring those into practice.

The editors of *Engineering News Record* annually choose the top 25 newsmakers from articles published in the magazine during the previous year. Two 2012 articles about CSH research prompted the inclusion of Ulm and the CSH on the list: an article about the CSH report, "The

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Effects of Inflation and Its Volatility on the Choice of Construction Alternatives,” and a story about a report by Ulm and graduate student Mehdi Akbarian evaluating the role of pavement design on vehicle fuel use.

Both reports have been widely circulated among industry and government representatives and prompted discussions about how best to adopt the findings.

According to the journal, individuals are selected for their “innovations and achievements, for giving back to the industry and the public, and for going beyond their day-to-day jobs.” Ulm, who is director of the CSH, is the only representative of academia on the list, which otherwise comprises people from industry and industry foundations, coalitions and trade organizations. The CSH executive director, CEE Professor Hamlin Jennings, will accept the award on behalf of the CSH at a gala in New York City on April 18.

Jennings, who was a member of the faculty of Northwestern University before joining MIT, developed the first fully quantitative model of the nanostructure of calcium silicate hydrate, the major component of hydrated cement. His model formed a basis for precisely predicting the mechanical properties of the material and using those properties to design new materials. It also laid the foundation for studying the mechanism that controls how cement hardens.

For instance, using information gleaned from Jennings’ model, CEE senior research scientist Roland Pellenq and Professor Emeritus Sidney Yip of the Department of Nuclear Science and Engineering and the Department of Materials Science and Engineering used atomic-scale modeling work to determine the basic structure of a calcium-silicate-hydrate particle and the behavior of molecules within that particle. Other work in the materials science of cement by CSH researchers continues to build on this foundation to work toward development of a more environmentally friendly concrete. Other CSH researchers focus on improving engineering applications of concrete and assessing the impact of concrete science and building technology on energy and climate policies.

Besides Jennings, Pellenq, Ulm and Yip, CSH principal investigators include professors Martin Bazant (chemical engineering), Markus Buehler (CEE), Marta González (CEE), CSH co-director Jeffrey Grossman (materials science and engineering), Krystyn Van Vliet (materials science and engineering) and Bilge Yildiz (nuclear science and engineering), and principle research scientist Randolph Kirchain, visiting professor Benoit Alain Coasne, and research scientists Nicola Ferralis and Jeremy Gregory. At present, the CSH has 17 postdoctoral researchers and about a dozen graduate student research assistants.

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