UChicago workshop on Oct. 26-28 will be jammed with ideas

By Steve Koppes
OCTOBER 24, 2012

"Form follows function" is a catchphrase of architects and designers, but a workshop at the University of Chicago will evaluate whether new fabrication techniques and constructions of randomly aggregated particles may already be chipping away at the foundations of that stalwart concept.

The workshop, titled "Fluidity, Adaptability, Rigidity: Frontiers in Pure and Applied Jamming," will meet Friday, Oct. 26 through Sunday, Oct. 28. Eighty participating architects, engineers, material scientists and physicists will meet for the workshop each day in a different, architecturally relevant building on the campuses of UChicago and the Illinois Institute of Technology: the Reva and David Logan Center for the Arts (designed by Tod Williams and Billie Tsien, 2012), 915 E. 60th St.; the Kersten Physics Teaching Center (Holabird & Root, 1985), 5720 S. Ellis Ave.; and the McCormick Tribune Student Center (REM Koolhaas/OMA, 2003), 3201 S. State St.

"This is the wilder side of jamming that we are exploring," said workshop co-organizer Heinrich Jaeger, the William J. Friedman & Alicia Townsend Professor in Physics at UChicago. "Jamming" refers to a field of study that deals with aggregates of randomly placed particles, including spheres or more complicated shapes, or even molecules.

Regular window glass is an example of a jammed aggregate of molecules. Because of the geometric proximity of the molecules to one another, they are unable to move. "Even though the system might want to flow and change, it just can't, like a traffic jam," Jaeger said. Like window glass, jammed systems behave like solids, "but they are structurally more akin to a liquid, so they live some sort of schizophrenic life that way."

The workshop grew out of shared interests in jamming among the co-organizers, including Sidney Nagel, the Stein-Freiler Distinguished Service Professor in Physics at UChicago, and Sean Keller, assistant professor of architecture at IIT. Their goal is to bring together their colleagues to discuss the properties of jammed systems and to assess their potential for designed applications, including formless ones.

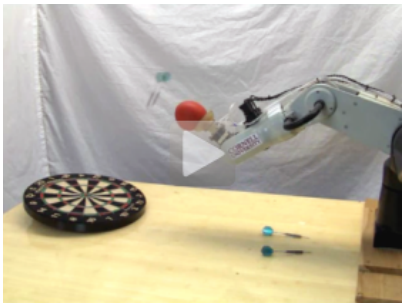
What constituted form originally sprang from the materials that would give the form its shape. But now three-dimensional printers — including one in Jaeger's laboratory — can directly connect material with function. They can produce new types of materials that can take any form, or that can even change form.

"In some sense we can make a connection between function and material now, and we don't need the intermediary of form any more," Jaeger said. "Form may become a secondary consideration in the end, because what looks like one thing now looks like another thing five minutes later."

Julian Rose and Garrett Ricciardi of formlessfinder, who have posted a manifesto about formless architecture on their website, will be among those discussing such ideas at the workshop in a session titled "Use/Less In/Efficiencies."

But formlessness also has found a soft robotics application. This again relates to the "adaptability" reference in the workshop title, to the development of forms that adapt and change shape. A fingerless but dexterous robotic hand that Jaeger has developed in collaboration with Cornell University's Hod Lipson and John Amend, and iRobot's Erik Steltz and Annan Mozeika, does just that. Their concept was simple: make a robotic hand by inflating and deflating a latex balloon filled

VIDEOS



John Amend and Hod Lipson/Cornell University

PHOTOS

Researchers at the University of Chicago, Cornell University and iRobot developed the Universal Robotic Gripper based on the jamming of granular material. The gripper will among the topics discussed at a workshop on "Frontiers in Pure and Applied Jamming," which will meet Oct. 26 to 28 at UChicago and the Illinois Institute of Technology.

Photo by John Amend/Cornell University

MEDIA CONTACT

Steve Koppes
News Officer for Physical Sciences
News Office
skoppes@uchicago.edu

with coffee grounds.

The first version of the robot gripper could pick up a variety of multi-sized objects, pour a glass of water or write with a pen. The improved Universal Gripper could shoot miniature hoops, throw darks and bowl.

Lipson, an associate professor of mechanical and aerospace engineering, will elaborate on this concept with his presentation on “Jamming Hands: From Grasping to Manipulation.” iRobot’s Erik Steltz will give a related talk on “Jamming-Enabled Soft Robotics.”

Packing is another aspect of jammed systems that workshop participants will consider, one that is still poorly understood. It took mathematicians four centuries to figure out how to prove the maximum density of a regular, crystalline packing of spheres. For randomly packed spheres only computer estimates exist, and the general packing behavior of irregularly shaped objects remains an unsolved problem. “We don’t have any design criteria or process, really, where if we say we want a certain outcome, then we better start with a certain shape,” Jaeger said.

The workshop will conclude with a panel discussion of prominent architects. Panelists will include Jeanne Gang of Studio Gang Architects, whose work includes Chicago’s 82-story Aqua Tower; and James Carpenter of James Carpenter Design Associates Inc., whose work includes New York City’s 7 World Trade Center. Steve Wiesenthal, associate vice president of Facilities Services and University architect, will moderate the discussion.

For the full list of speakers and program details, see http://jamming.uchicago.edu/program_new.html.

The workshop is sponsored by the Institute for Molecular Engineering, Computation Institute, Arts | Science Initiative, Arete, the Office of the VP for Research and National Laboratories, and the Chicago Materials Research Center, all at UChicago. For more information, see http://jamming.uchicago.edu/.

TAGS

Architecture, Heinrich Jaeger, jamming, Physics, Sidney Nagel

(773) 702-8366

Reserved for members of the media.

ON TOPIC

'Thinking into the Future' event brings architect Rafael Viñoly to Logan for discussion
October 2, 2012

STAY CONNECTED

Follow UChicago’s social media sites, news feeds and mobile suite.

5801 South Ellis Avenue
Chicago, Illinois 60637
(773) 702-1234