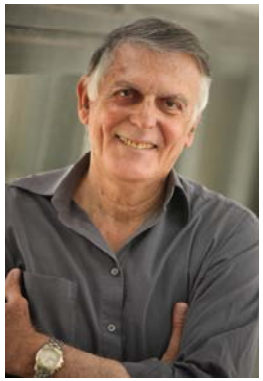

Dan Shechtman Symposium

Friday, July 29th
9:00 a.m. – 3:30 p.m.
1227 Hoover Hall
Iowa State University
Ames, Iowa

9:00 am - Introductory remarks
Jonathan Wickert, ISU College of Engineering Dean
Professor Alex King, Ames Lab Director

9:30 am - Professor Walter Steurer, ETH - Zürich
"Fascinating Quasicrystals"

10:30 am - Professor David Rabson, University of South Florida
"A Prehistory of Quasicrystals"

11:30 – Lunch for all attendees (Hoover Atrium)

1:00 - Professor Ron Lifshitz, Tel Aviv University
"Mesoscopic Quasicrystals"

2:00 - Professor Pat Thiel, Iowa State University
"No pain, no gain. Expanding the Understanding of Quasicrystals with Surfaces, and Vice-versa"

3:00 - Closing remarks
Pat Thiel
Cake and coffee

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Materials Science & Engineering

THE Ames Laboratory
Creating Materials & Energy Solutions
U.S. DEPARTMENT OF ENERGY

The Scientific Speakers:

Walter Steurer, Professor
Department of Materials, ETH, Zürich, Switzerland

"Fascinating Quasicrystals"

Abstract: It took Dan Shechtman more than two years to get his discovery of an icosahedral Al-Mn phase published. In the beginning, nobody believed in the existence a new ordering state of matter seeming to contradict crystallographic laws. Today, more than 25 years later, we know that quasicrystals (QCs) do exist and that their structures are different from everything known before. However, there are still quite a few open questions. We do not really know what governs their formation, growth and stability, whether QCs are a ground state of matter or entropy stabilized high-temperature phases, if their structures are strictly quasiperiodic or only on average and why only QCs with 5-, 8-, 10-, 12-fold rotational symmetry have been found so far. All these points will be addressed in the talk and typical quasiperiodic structures will be discussed. I will also try to demystify the higher-dimensional approach by looking at the well-known strip-projection method from a different angle, demonstrating that its physical basis is in the cluster shape. This unusual view should also help sketching the big picture of QC formation.

David Rabson, Associate Professor
Department of Physics, University of South Florida

"A Prehistory of Quasicrystals"

Abstract: Quasicrystals were discovered in 1982, but people have been thinking about symmetry and structure for far longer. In a brief but idiosyncratic prehistory of quasicrystals, I will argue that the premature discovery of ordered crystals with five-fold symmetry in the eighteenth century might have set science back by 200 years. I will conclude with a few equally idiosyncratic thoughts about the future.

Ron Lifshitz, Associate Professor
Department of Physics, Tel Aviv University, ISRAEL

"Mesoscopic Quasicrystals"

Abstract: There is a growing interest in the ability to generate quasicrystals, with structure on a mesoscopic scale, ranging from artificially constructed metamaterials such as photonic quasicrystals, to self-assembled soft-matter quasicrystals. In addition to having promising applications, especially in the optical domain, these materials give us the opportunity to study quasicrystals in ways that were impossible before. I will discuss a few aspects of our ongoing work on these systems, ranging from our recent explanation of the stability of quasicrystals composed of soft isotropic particles to the design of nonlinear photonic quasicrystals for optical frequency conversion.

Pat Thiel, John Corbett Distinguished Professor of Chemistry
Senior Chemist in the Ames Laboratory
Departments of Chemistry & Materials Science & Engr.
Iowa State University

"No pain, no gain. Expanding the Understanding of Quasicrystals with Surfaces, and Vice-versa"

Abstract: The science of quasicrystals has changed surface science, and surface science has changed the understanding of quasicrystals. The first ultrahigh-vacuum-type surface studies of quasicrystals were published by a group at Bell Labs in the early 1990's. This was followed by a veritable explosion in research on this topic. Examples of concepts that have consequently changed, within the field of quasicrystals, include the role of clusters in stabilizing the bulk structure, and the role of atomic structure in quasicrystals' low friction. Examples of concepts that have changed within the field of surface science include the tractability of structure analysis or modeling without periodic boundary conditions, and inhomogeneous nucleation in thin film growth. These and other examples will be presented in this talk.