



## Workshop on Sphere Packing and Amorphous Materials

25 - 29 July 2011  
Miramare - Trieste, Italy

The Abdus Salam International Centre for Theoretical Physics (ICTP, Trieste, Italy) is organizing a *Workshop on Sphere Packing and Amorphous Materials* to be held at the ICTP, from 25 - 29 July 2011.

### DESCRIPTION:

Packing problems have played an important practical role since the dawn of civilization, and they continue to intrigue scientists today, with connections to a host of problems in the physical sciences, mathematics, and materials science. While optimal packing problems are intimately related to ground states of condensed matter, disordered sphere packings have been employed to model the glassy state of matter. Sphere packings in high dimensions arise naturally in information theory as error-correcting codes. Examples of cross-fertilization between the physical sciences and mathematics abound in this field.

One key challenge is to give a precise mathematical characterization of the concepts of "jamming" and "disorder". Another one is to identify the densest packings in sufficiently high dimensions and understand their structure, since disordered sphere packings might be at least as dense as the best lattice packings in large dimensions. Understanding the symmetry of dense packings is of fundamental importance in both physics (e.g., solid vs. fluid states) and mathematics (Hilbert's 18th problem), and information theory. In the last five years, a fruitful interaction has between physicists and mathematicians led to the discovery that typical minimum energy configurations display novel arrays of topological defects with well-defined mathematical and physical meaning and potential applications to supra-molecular chemistry and the design of novel meso-scale materials.

The aim of our Workshop is to accelerate the interchange of ideas between different fields by bringing together a diverse group of physicists, chemists, engineers, and mathematicians who work on packing problems.

### PARTICIPATION:

Scientists and students from all countries that are members of the United Nations, UNESCO or IAEA may attend. As the Workshop will be conducted in English, participants should have an adequate working knowledge of this language. Although, the main purpose of the Centre is to help research workers from developing countries, through a programme of training activities within a framework of international cooperation, a limited number of students and post-doctoral scientists from developed countries are also welcome to attend.

As a rule, travel and subsistence expenses of the participants should be borne by their home institution. Every effort should be made by candidates to secure support for their fare. However, very limited funds are available for partial support of some participants who are nationals of, and working in, a developing country, and who are not more than 45 years old. Such support is available only for those who attend the entire Workshop. **There is no registration fee for attending this activity.**

### HOW TO APPLY FOR PARTICIPATION

An Online Application Form can be accessed through the Conference website:  
<http://agenda.ictp.it/smr.php?2254>

Once in the website, comprehensive instructions will guide you step-by-step on how to fill out and submit the Application Form.

### WORKSHOP SECRETARIAT:

Telephone: +39-040-2240346  
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### ORGANIZERS:

**Henry COHN**  
(Microsoft Research, Cambridge, USA)

**Salvatore TORQUATO**  
(Princeton University, NJ, USA)

**Francesco ZAMPONI**  
(ENS, Paris, France)

### LOCAL ORGANIZER:

**Antonello SCARDICCHIO**  
(ICTP, Trieste, Italy)

### TENTATIVE LIST OF SPEAKERS:

(as of January 2011)

**C. Brito** (UFRG, Porto Alegre, Brazil)

**P. Chaikin** (NYU, USA)

**B. Chakraborty** (Brandeis, Waltham, USA)

**P. Charbonneau** (Duke Univ., Durham, USA)

**R. Connelly** (Cornell Univ., Ithaca, USA)

**S. Coppersmith** (Univ. Wisconsin, USA)

**N. Elkies** (Harvard Univ., Cambridge, USA)

**W. Ellenbroek** (TU Eindhoven, The Netherlands)

**A. Kumar** (MIT, Cambridge, USA)

**G. Kuperberg** (UC Davis, USA)

**J. Kurchan** (ESPC, Paris, France)

**D. Nelson** (Harvard Univ., Cambridge, USA)

**C. O'Hern** (Yale Univ., New Haven, USA)

**T. Truskett** (Univ. of Texas at Austin, USA)

**S. Vance** (Adams State College, Alamosa, USA)

**R. Zieve** (UC Davis, USA)

**Deadline for Application:**

**1 APRIL 2011**