

**MS45 P01**

**Dense packing of identical ellipses and pebble walls**  
 Takeo Matsumoto<sup>a</sup>, Masaharu Tanemura<sup>b</sup>, <sup>a</sup>Kanazawa University, Japan. private address : 2-77, Tsuchisimizu, Kanazawa, 920-0955, Japan, <sup>b</sup>The Institute of Statistical Mathematics, Tokyo, Japan.

E-mail : [matsumoto.ty.920@biscuit.ocn.ne.jp](mailto:matsumoto.ty.920@biscuit.ocn.ne.jp)

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There are 7 dense packings of ellipses with 6 contacting neighbours [1],[2]. Among them, 2 types of  $p2$  and  $c2mm$  packings of ellipses attain the maximum density, 0.9069..., the density of the closest packing of circles,  $p6mm$  [3], while the  $p2gg-2a2$  packing cannot attain the maximum density [4].

Since 1992, Tanemura & Matsumoto [5],[6] and [7] have presented the proof, with the aid of computer, that the other three types of packings of ellipses, ( $p31m$ ,  $p3$  and  $p2gg4c1(I)$ ), cannot exceed the maximum density of circles.

The other  $p2gg-4c1(II)$  packing of ellipses also shows no maximum density, and is composed of  $p2$  and  $p2gg-2a2$  regions. The packing density is the function of the shape parameter (major and minor axes) and the tilting angle. The  $p2gg$  pebble packing of the pebble wall often shows about 90° zigzag packing. This is the minimum density packing and economical construction.

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[2] Grünbaum, Schephard, 1987, Tiling and Patterns.

[3] Matsumoto, Nowacki, Zeit. Krist. 1966, 23, 6, 401-421.

[4] Matsumoto, Zeit. Krist. 1968, 126, 179-174.

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**MS45 P02**

**Archeological bronze objects studied by neutron based methods**  
 Zsombor Sánta<sup>a</sup>, György Káli<sup>a</sup>, Adel Len<sup>a</sup>, Zsolt Kasztovsky<sup>b</sup>, László Rosta<sup>a</sup>, Katalin T. Biró<sup>c</sup>

<sup>a</sup>Research Institute for Solid State Physics and Optics, 1525 Budapest, P.O.B. 49, Hungary. <sup>b</sup>Institute of Isotopes, 1525 Budapest, P.O.B. 77, Hungary. <sup>c</sup>Hungarian National Museum, 1088 Budapest, Múzeum Körút 14-16. E-mail: [santa@szfki.hu](mailto:santa@szfki.hu)

**Keywords:** neutron methods, archaeometry, bronze axes

The neutron based nondestructive analysis methods High Resolution Time of Flight (HR-TOF-D), Prompt Gamma Activation Analysis (PGAA) and Small Angle Neutron Scattering (SANS), have been applied for the investigation of archeological bronze objects at Budapest Neutron Centre (BNC). The quantitative elements and phase composition measurements as well as microstructure

characterization of Bronze Age axes were done in order to recover information of its manufacturing (hammering or casting).

**MS45 P03**

**Constructing Knowledge - Models and Model-Building in Chemistry**  
 Anke Zürn, *Inorganic Chemistry, Department of Chemistry and Applied Biosciences, ETH Zurich.* E-mail: [zuern@inorg.chem.ethz.ch](mailto:zuern@inorg.chem.ethz.ch)

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Within the context of the “art, science & business” fellowship program at “Akademie Schloss Solitude” I curated an exhibition on models and model building in chemistry and crystallography [1]. Concrete examples from chemistry, crystallography and materials sciences were exposed to investigate the significance of models and the model-building itself for research and teaching. In parallel the architect Markus Grob exposed models of historic houses, which he had built together with his students. The opening of the exhibitions was during a symposium on working strategies in architecture. This setting fostered a profound discussion on creativity as well as on the working methods and working processes of artists, architects, and scientists.

Here I will report on the exhibition in order to encourage the development of inter- and transdisciplinary projects on crystallographic themes.

[1] “Constructing Knowledge - Models and Model-Building in Chemistry”, an exhibition curated by Anke Zürn, Akademie Schloss Solitude, Stuttgart, Germany, 2004, <http://www.akademie-solitude.de/>