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By: Gabriel Gache, Science News Editor



Sandcastle
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Anyone can Build a Sandcastle!

Researchers reveal the secrets of moist sand

Add water, sand, a bit of imagination and hope it won't collapse too soon, the rest is a piece of cake, scientists say. Quite odd, however, is the fact that sand doesn't require a specific amount of water to maintain its mechanical properties, feature observed by scientists during laboratory experiments which revealed that sand containing only 3 percent of fluid is still capable to create a highly-complex internal structure. Furthermore, sand containing water concentrations ranging between 1 to 10 percent has virtually constant mechanical properties, while its internal structure can experience severe changes. Now, a team of researchers from the University of Erlangen, the Max Planck Institute for Dynamics and Self-Organisation and the Australia National University claim to have discovered the laws which govern the fluid structures in moist sand granules through a x-ray microtomography technique, similar to that routinely used for medical imaging. The method consists in scanning the object with X-ray light from multiple angles, in order to obtain an image of the object relatively similar to that of a standard X-ray, which can be then processed into a three-dimensional structure, which an outline image of the object can be extracted from. X-ray microtomography techniques require powerful X-ray sources, such as X-ray radiation-obtained synchrotron particles accelerators, that can produce images with a resolution as high as a millimeter, enough to probe the internal structures formed by moist sand granules. However, what they have observed came more as a shock, as water does not tend to fill the all spaces of the structure, but exists in a mix of sand and water. Researchers argue that this happens because water particles tend to accumulate as much sand granules as possible around them, while air pockets do not have too high affinity towards neither water nor sand. Further investigation into the dynamics of moist sand internal structure revealed that, due to this unique configuration, pressure differences are experienced throughout the whole structure, which also seems to be independent of the water concentration, that basically means the internal pressure of the moist sand structure is balanced by the outside pressure, giving it overall stability and mechanical properties constance. The leader of the project, on the other hand, writes that this experiment was not just another play in the sand as one might think, since the results give important insight into the dynamics of landslides, the pharmaceutical and food-industries and a number of natural disasters, which until now have not been very well understood.