

# Scientists grinding 'perfect' spheres

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**CANBERRA, Australia** (Reuters) -- They will be the earth's roundest spheres, crafted by Australian scientists as part of an international hunt to find a new global standard kilogram.

Ever since scientists discovered that the current standard -- a bar of platinum and iridium held in a French vault since 1889 -- was slowly deteriorating, the search has been on for a replacement.

Using a single crystal of silicon-28 grown by Russian and German scientists over three years, a team of Sydney scientists and engineers will grind and polish two silvery balls, each weighing precisely one kilogram, with imperfections of less than 35 millionths of a millimeter.



Scientist Achim Leistner measures the roundness of a sphere.

"We are doing everything to really create a perfect object. It's not only near-perfect in roundness, but also the crystal purity, the atomic species and so on," project leader Walter Giardini told Reuters on Friday.

"Silicon is a very nice material to use that we understand well, makes good crystals and can be worked," said Giardini, from Australia's National Measurement Institute.

The two balls will take 12 weeks to create and, because they are made from a stable element, they will not fall victim to moisture, corrosion and contamination like the current kilogram standard, known as the International Prototype.

The spheres will be a step along the perfect kilogram road, with the project's ultimate aim to re-define the kilogram in terms of numbers of atoms, rather than an object open to damage from earthquake or environmental changes.

"The aim is not to change the value of the kilogram, but to ensure its stability for all future times," Giardini said. "It will no longer depend on an actual physical object and this is going to allow us to relate the mass to the individual atoms."

The project is a collaboration involving scientists from Russia, Germany, Italy, Belgium, Japan, the United States and Australia, in cooperation with the International Bureau of Weights and Measures. On completion, the spheres will be measured for volume in Australia, Germany and Japan, then measured for mass. Belgian scientists will look at the molar mass of the crystal used to calculate the number of molecules in each sphere.

Australian scientists have the most expertise in grinding near-perfect spheres, having been turning

them out for clients including NASA since the early 1990s.

"We have developed technology so that we can see what we are getting, whether they are slightly oval or flat. We are trying for an accuracy of two parts in 100 million," Giardini said.