Our gold was a crash delivery from space, study finds

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Courtesy of the University of Maryland
and World Science staff

Gold prices seem otherworldly these days—which may be fitting in light of a new study that says almost all our Earthly stocks of the coveted metal probably crashed here from space long ago.

The study suggests gold, platinum, palladium and related elements found in the crusts and mantles of Earth, the Moon and Mars arrived as part of impactors the size of small planets.

Freshly mined gold. (Courtesy Calif. Geological Survey)

The impacts would occurred during the last phase of planet formation in our solar system, some 4.5 billion years ago, and within tens of millions of years of an even bigger impact that produced our Moon, say scientists. The findings are published in this week's issue of the research journal *Science*.

Current understanding of Earth and planets of similar makeup suggest our world should have "essentially no gold" that we can get at, said University of Maryland Geology Professor Richard Walker, one of the authors. That's because gold and several other precious metals are among a class of elements that are usually found in combination with iron, which forms the core of Earth.

"Iron-loving elements are pulled into the planet cores as they form," Walker explained, so the yellow metal should have been too deep for us to reach.

Since this isn't the case, Walker said, something probably happened to bring these elements to Earth late in its formation, after its layers finished separating. What scientists didn't know until now, he added, was whether this bombardment occurred in big chunks over a relatively short time or as a "rain" of smaller pieces of material over a longer time.

Walker and colleagues used computer models to assess what size objects would best match the needed criteria. These included providing the right amount of iron-loving metals to the Earth, Moon and Mars; being large enough to breach the crusts and mantles of these bodies, creating local molten rock ponds from their impact energy and efficiently mixing into the mantle; and not being so large as to cause the cores to fragment and re-form. The latter would presumably cause the new gold to follow the old into the unreachable depths.

The researchers found that they could best meet the criteria if the impactors were few and massive. The largest Earth impactor should have been about 1,500 to 2,000 miles wide (2,400 to 3,200 km), roughly Pluto's size; impactors hitting the Moon would have been around a tenth as wide.

"These impactors are thought to be large enough to produce the observed enrichments in highly siderophile [iron-loving] elements, but not so large that their fragmented cores joined with the planet's core," said William Bottke of the Southwest Research Institute in San Antonio, Texas, the

lead author of the paper.

The team also maintains their predicted projectile sizes are consistent with physical evidence such as the size distributions of today's asteroids and of ancient Martian impact scars.