MINE, ALL MINE!

Throughout history, gold has been prized around the world and eagerly sought. But where does it come from, and where does it all go? By Neil Savage.

\$89T

Total value of all mined gold in trillions of US Dollars

WHERE DOES GOLD COME FROM?

World gold production 2010

GOLDEN MILESTONES

Key moments in the use of the precious metal in science and technology

ca. 700

The Etruscans use gold bands in dentures.

1803

Luigi Brugnatelli of Italy electroplates two silver medals with gold.

1848

California's Gold Rush starts the extraction of more than 90% of the gold ever mined.

1856

Michael Faraday experiments with suspensions of gold in solution.

1887

Invention of the McArthur-Forrest process using cyanide to extract gold from low-grade ore.

GOLD IN PERSPECTIVE

Gold production pales in comparison to that of other technologically important minerals

(2011 data in tonnes)

THE PHYSICS OF GOLD

Electrons orbit the nucleus at half the speed of light, relativistically shrinking the highest-energy (6s) orbital in a way that accounts for gold's chemical stability and hue

Nucleus contains 79 protons and 118 neutrons

5d orbital is relativistically enlarged

6s orbital is relativistically shrunk so this high-energy electron is, on average, closer to the nucleus than are the 5d electrons, making it less available to bind to other atoms

Relativistic effects shrink the energy gap between 5d and 6s electrons so the atom absorbs blue light; what we see is a combination of the other colours in the spectrum, which add up to a golden hue

WORLDWIDE DEMAND FOR GOLD IN 2011

Gold is mostly required for jewellery, technology and money

PRECIOUS COMMODITY

The price of gold, long set by governments, remained steady from the early eighteenth century well into the twentieth century

1911

Ernest Rutherford shoots alpha-particles through gold foil to reveal the existence of the atomic nucleus.

1957

Jack Kilby uses gold wire connectors in the first integrated circuits.

1985–1987

Masatake Haruta and Graham Hutchings demonstrate the use of gold as a catalyst.

1996

Chad Mirkin and Paul Alivisatos use DNA to build gold nanoparticles.

2000

Boston Scientific starts selling a gold-plated stent for heart surgery.

2012

The FDA approves Verigene, a gold nanoparticle diagnostic device to identify infectious bacteria.