Homo sapiens' need for resources is voracious and unending; anything less than 100% efficiency in recycling, reuse or repurposing means that new material sources must be found and refined… and the Earth has only so much to give.

The deepest mine on Earth - the Mponeng digging in South Africa - penetrates less than 4km below the surface. At that depth, the rock sizzles at 60°C, as workers sweat and scramble to extract gold from a single seam less than a meter wide. Meanwhile, untold wealth is orbiting in the sky, far above our heads.

“For the winds that awakened the stars  
Are blowing through my blood.”

W.B. Yeats, *Hanrahan Laments Because of his Wanderings*

**Formation**

The fundamental elements of the Universe - hydrogen and helium - were formed during the Big Bang. Drawn together, these elements form stars, where almost every other atomic structure is cooked into existence. When these suns explode as supernova, their structure is ejected into the galaxy at close to the speed of light. Over billions of years, drawn together by gravitational perturbation, particles from different suns collect and clump together. Gravity and spin do the rest, forming new stars and planets - heavy, mineral-rich rocky bodies, gas giants, and icy worldlets - and eventually, you: the iron in your blood, the calcium in your teeth, were all formed in the hearts of stars.

This process is not perfect: floating between the planets are billions of half-formed structures, the leftover and discarded remnants of the solar system. These asteroids contain the raw ingredients of the cosmic construction process; in our local solar system, they are classified by both composition and distance. The metallic-bearing asteroids, known as *M-types*, are the third most populous type, and there are millions of them.

**Trillions**

Some of these bodies are *huge:* one of the largest, 511 Davida, is 270 ~ 310 kilometres in diameter, and 50 sextillion kilos in mass, much of it nickel and iron. If it could be retrieved and mined, the asteroid’s ore would be worth over 100 *trillion* dollars on today’s market. Another, 16 Psyche, is thought to be the shattered iron core of a protoplanet.

Of course, the mass and composition of an asteroid is not the only determinate of how profitable it might be. The body’s orbit is also important - Davida is more than three times the Earth’s distance from the sun, for example - and the technology required to mine in zero gravity has yet to be developed. More fundamentally, we’re barely capable of landing on planets in the solar system in a predictable way, much less asteroids.

| Most profitable asteroids | | | |
| --- | --- | --- | --- |
| **Name** | **Type** | **Est. Value** | **Est. Profit** |
| Ryugu | Cg | 95.02 billion | 34.53 billion |
| Neresus | Xe | 4.71 billion | 1.39 billion |
| Bennu | B | 9.05 billion | 2.5 billion |
| Didymos | Xk | 62.5 billion | 16.4 billion |

**Other Sources**

However, asteroids are not the only source of wealth near the Earth: the Moon has been collecting Helium-3 on its surface from the sun’s solar wind for billions of years, which could be used to power fusion reactors. Comets can provide water, methane, and other chemicals.

**Mining Concerns**

Today, several companies are seriously looking at mining near-Earth asteroids, including Planetary Resources, Deep Space Resources, and Asteroid Mining Corporation. Technological development continues, with the hope that it outpaces the exhaustion of Earth’s diminishing natural resources.

Image of Earth courtesy NASA Goddard Space Flight Center. Asteroid courtesy NASA