

ASTEROID MINING 101

WEALTH FOR THE NEW SPACE ECONOMY

JOHN S. LEWIS

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This profound book, written by Dr. John S. Lewis, Professor Emeritus of Planetary Sciences at the Lunar and Planetary Laboratory of the University of Arizona and present Chief Scientist at Deep Space Industries (DSI) can be considered to be the undisputed the asteroid prospector's handbook.

The book summarizes all scientific research results and knowledge up to date and can be considered as the asteroid research, categorization and classification baseline. Indeed, approximately three quarters of its contents is dedicated to the definition, categorization and characterization of asteroids enhanced with very illustrative images of asteroid/meteorite samples.

As Rick Tumlinson says in the foreword: "You will learn more about the types and forms of asteroids than you thought possible, this book is not easy. It is serious and you will have to work a bit to understand all it has to offer. But if you do the work and spend the time you will graduate into the class of crazies who change the future."

But the book does not stop there, it offers concepts on how the next steps of asteroid mining could look like and in this respect it kind of picks up where the "The High Frontier" by Dr. Gerard K. O'Neill left off.

I like the three step approach of DSI, starting with exploration and categorization of asteroids (using Cubesat combinations and hitching available rides on readily available flights - FireFly) followed by grapple or landing attempts and sample returns (DragonFly) and, finally having found the right target, to start the exploitation. As you will learn from reading the book there are a lot of constraints and conditions to be observed.

After the explanation of the various mining techniques to be used in the absence of gravity and diesel fuelled processing equipment – and there are an astonishing variety of methods available - John Lewis addresses the core question: how can a commercial asteroid miner match sources and demand sites? His answer is:

"We can see ways to provide a wide variety of products, starting with volatiles and ferrous metals, in space. But where are these products needed? Ideally, we should establish not only where these materials are needed, but the quantities in which they are needed and the present cost of meeting those demands from Earth."

Of course that is easier said than done, but John Lewis is convinced that the future has already begun. He demonstrates this with a very interesting table summarizing the more than ten "asteroid-activities" so far: starting with Galileo NASA/ESA, 1991 which flew by 951 Gaspra en route to Jupiter, followed by Rosetta/Philae, Hayabusa, Dawn, Chang'e, ending with Osiris-Rex and the asteroid Retrieval Mission (ARM) by NASA 2019? ~150 ton, under study.

Which means that asteroids are fascinating enough to study and explore them, however there is a long way to go to make asteroid mining profitable.

Another aspect mentioned in the book shall not be underestimated, our very vital interest in detecting and deflect catastrophic Earth threatening asteroids. In this respect the planned ARM mission makes a lot of sense, because the better we learn how to intercept and influence the orbits of asteroids the higher the chance to avoid a life threatening impact on our planet.

A recent BBC report (Colin Barras) is ranking this as second severe threat (besides gigantic volcanic eruptions) to wipe out all life on Earth (within the next 450 million years – maybe?).

This book is highly recommended to those who are interested in space and want to be prepared for the future of our planet.

Joachim J. Kehr, Editor SpaceOps News