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## **Moon Rocks**

By Glenn Fishbine

*Editor: a person employed on a newspaper whose business it is to separate the wheat from the chaff, and to see that the chaff is printed.*

Elbert Hubbard

Many years ago, I tried to assign a new project to an engineering manager. He looked at the specifications that I'd given him and said, "If we only had *moon rocks*." I stared at him with a puzzled expression. "*Moon rocks*, that's what we need," he grumbled. I asked, "*moon rocks*?" He looked at me, and said, "Yes, *moon rocks*. You see, you want me to do some *moon rock* engineering." I asked, "What's that?" He glared at me with that serious expression that comes from too many myopic hours spent solving non-linear differential equations and pronounced, "well, the specification says we're going to take an optical system that has a 30-inch focal length and compress it into a space of about 1 inch. I think I can do that, but I need some *moon rocks* to do the engineering—" I finally got his point. If someone asks you to do the impossible, you might as well start by asking for the impossible in return.

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This fall, I finished the final touches on a book entitled ***The Investor's Guide to Micromachines and Nanotechnology***. I'm not sure if it was a labor of love or one of those punishments that comes from watching too many Star Trek episodes. When I started writing the book, I had an intense fascination with the coming age of nanotechnology. The deeper I got into the subject material, the more moon rocks I found. If only we had a working atomic assembler... If only we had carbon nanotubes 1 cm in length... If only we had some diamondoids... The *only ifs* started to get to me so that I would wake up in the middle of the night in a cold sweat, dreaming about micro-robots and nano-manipulators and other capabilities that might never exist. I almost abandoned the book project to search for a new topic that had some reality. Notwithstanding the NNI's half billion dollar investment, I was torn between the almost religious fever of nanotechnology's proponents, and the rather boring surface physicists stuck in the dank dust free labs of Intel, IBM, and CERN. In truth, there is a lot of nanotechnology on the brink of breakthrough. There is also a lot of nanotechnology that is merely on the brink. By the time I finished the book and sent it off to my publisher, I had become a somewhat jaded realist on the scope and potential of an emerging technology. Some parts are real. Some parts will be real, as soon as that truckload of moon rocks arrives.

What I hope to do in this column is to provoke some serious debate over what we can, should, and will do, as the investment in nanotechnology continues to expand. Oh, it will expand. There are plenty of people who purchase moon rocks every day. P. T. Barnum once suggested that there was one born every minute. There are also some very serious, very professional, and very meaningful professionals who are making incredible

discoveries and inventions, without the aid of moon rocks.

Nanotechnology will reshape our world, as it has for the last 30 years. Seventy percent of the growth in the GDP is based on the physics associated with quantum and nanotechnologies. These are not technologies waiting to happen. These are mature technologies that are branching in new and dramatic directions. It is my hope, as I add to these columns in the future, that I will entertain, educate, and enrage, in a manner that provokes thoughtful and serious development of one of the top three candidates for the #1 technology of the 21st century. Nanotechnology might rank only a few small steps behind Genomics and Nintendo.

In each of these columns, I hope to show two sides of a selected nanotechnology. One side is the hype. The other side is the value. With luck, there will be ruffled feathers and furious debate. In the next column, I will explore some of the finer tidbits of nano-lore. The virtues of carbon and the considerations that will keep space elevators from ever leaving the ground.

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