

The Magic Dust

How humans ruled the atom and became immortal

by **António Lopes**

It all started with a implantable device that propelled itself through the bloodstream of a patient^[1]. It marked the beginning of a revolution in miniaturized devices that, by breaking free of the old generation of large stationary implantable objects, such as pacemakers and cochlear implants, became small enough to actually pass through the human body to deliver drugs and perform diagnostics more efficiently.

This medical device, which was powered wirelessly via electromagnetic radio waves (thus eliminating the need to carry space-hogging batteries), was mainly used as a diagnostic tool at first. Packed with tiny sensors, it traveled through the human body collecting valuable information^[2] that could be read by doctors in almost real-time and delivering drugs to specific areas of the patient's body^[3].

Given its proficiency in helping doctors to accurately operate inside the human body, the device quickly evolved to be used as a surgical tool. It started by performing minor surgeries such as removing blood clots from affected areas that would otherwise require anticoagulants and then went on to more complex surgeries such as targeting specific types of cancer^[4] in areas that would require a risky and invasive surgery performed by highly-skilled surgeons.

When mini and micro wasn't enough

At some point, these devices reached their miniaturization threshold and most researchers were unable to develop new materials that could help overcome these limitations. However, a group of scientists decided to build them from scratch, atom by atom^[5], instead of just trying to further miniaturize such devices. This new technique, that became known as molecular manufacturing, consists on the production of complex and atomically precise structures using positionally controlled fabrication and assembly of nano parts inside a nano factory.

Along with the development of fast and accurate 3D printers^[6], this new technique allowed for the creation of much smaller devices that were, not only able to execute the same tasks as the previous devices but that were now much smaller and could operate inside the human body in much larger numbers than before.

The possibility of having multiple devices operating inside the human body instead of just one (much more complex and larger) device motivated some scientists to use the "divide and conquer" approach, in which the nano devices could perform simpler tasks across the entire body that, as a whole, were more efficient than a single more intelligent device. Moreover, since these nano robots were built at a molecular level, they were able to assume new shapes or even replicate themselves in order to fully adapt to their goals^[7].

From health-care to life extension

Health-care was revolutionized by this kind of devices by allowing for more accurate information and minimal invasion of the human body. But scientists quickly realized that such technologies should not only be used in a reactive manner (dealing with complicated health conditions) but also in a preventive manner, aiming to extend life expectancy even in healthy people.

At first, they developed the "microbivore"^[8], which acted as an artificial mechanical white cell, seeking out unwanted pathogens including bacteria, viruses,

or fungi in the bloodstream. The *microbivore* simply absorbed such tiny elements, minced, digested and harmlessly released them back in the bloodstream as amino acids, mononucleotides, simple fatty acids or sugars. Subsequent generations of these nano robots were programmed to quickly recognize and digest even the tiniest aggregates of early cancer cells, thus greatly reducing the cancer's death rate.

Surgical procedures became even more accurate with these nano robots going as far as extracting all existing chromosomes from a diseased cell and insert fresh new ones in their place. In fact, this was the basis for most health extension projects and initiatives. By using chromosome replacement therapy based on nano robots, scientists were able to correct the accumulating genetic damage and mutations that led to aging in every one of our cells.

Facing immortality

Although most scientists were merely worried about health extension, it soon became clear that life extension was a natural consequence of these approaches. As diseases were cured, causes of death were avoided and as scientists made use of technology to improve people's health, the global life expectancy increased immensely.

Now that people are starting to live longer, much longer, immortality is within our grasp. With each passing decade, the corresponding advances in nano technology allow for less and less people to die of natural causes. In fact, the last people to have died now of known natural causes were those that were middle aged by the end of the 20th century. We still age now but at a much lower pace. And people still die of natural causes, because not all diseases can be addressed with nano technology or simply because their cause was not yet found.

The magic dust

All of this is now possible due to the "magic dust". This is the generic term we use, it's not really dust. It's simply a way of describing the sprays that we use in our daily lives ranging from health situations to entertainment. For example, if you scratch yourself or you cut your finger somehow, just use a healing spray on the wound and the billions of nano-particles will simply assemble and help regenerate the wound in just a few minutes instead of days. We no longer use pills or any kind of medicine in solid or liquid form. The nano particles in the healing sprays are so small that they can easily traverse our skin through the pores and then travel the bloodstream to the necessary areas of the human body that require any kind of treatment or diagnosis.

These sprays are also applied with other goals in mind. For example, recreative drugs are very common now and most of them are legal since they are no longer based on harmful chemicals and provide instead a direct stimulus to the brain using accurate and well-engineered nano particles that act upon specific areas of the brain. This kind of particles have also revolutionize human-machine interfaces since we no longer use displays of any kind. Visual images can simply be transmitted to a mash of nano receivers in the brain that stimulate the visual cortex, thus displaying the images directly in the person's mind. This also applies to computer peripherals, which we no longer use. To interact with more sophisticated computing devices we simply use nano transmitters that are lodged in our brains to send commands to the computer. In fact, this text was *thought* while I was traveling to *Gliese 581 c* last week.

We definitely live in very exciting times here in the 22nd century. I just wished I had the ability to predict all of this back in the beginning of the 21st century when I was a young researcher. I probably would have earned a lot of money investing in nano-technology. Well, I can't say I haven't done well. After all, I was still smart enough to invest in artificial intelligence.

- [1] **CNET: Implantable device propels itself through bloodstream**^[↵]
- [2] **The Verge: Cyberplasm: a disease-searching robot based on parasitic fish**^[↵]
- [3] **Slashdot: Gold Nanoparticles Help Red Blood Cells Deliver Drugs**^[↵]
- [4] **WebProNews: Crab-Like Robot Can Remove Stomach Cancer**^[↵]
- [5] **Slashdot: Scientists Build Graphene From Scratch, Atom By Atom**^[↵]
- [6] **Singularity Hub: 3D Printer Cranks Out Exquisite Structures Smaller Than Dust Mites And Sets A New World Record**^[↵]
- [7] **MIT News: Self-sculpting sand**^[↵]
- [8] **Life Extension Magazine: Nanotechnology and Radically Extended Life Span**^[↵]