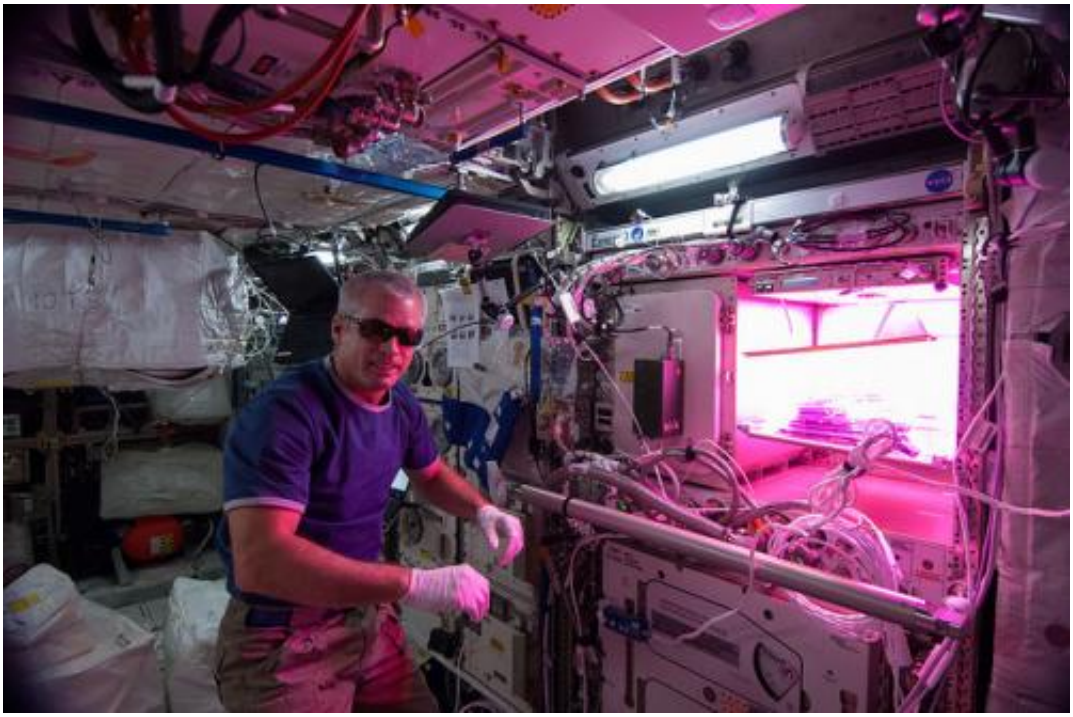
Cutting funding for basic scientific research would be a big mistake

January 13 2015, by Eduardo Nicolas Schulz



Science in space. Credit: NASA, CC BY-NC

For all the exciting stories and developments that basic science research produces, there is one question that the public never tires of asking: "What are the possible applications of that discovery?" or "What is the value of your research?" While the question is arguably one worth asking, the answer doesn't always convince everyone. And if it isn't convincing, people are quick to react: "Why then are we investing insane

amounts of money into those experiments?"

These questions aren't just benign queries. They can have real-life consequences, such as how UK politicians are reconsidering funding certain science projects.

I hope to convince you that funding basic science research is very important. The main reason to keep funding basic research, even if applications aren't in sight, is because historically it is this research that has brought humanity most benefits.

History is full of examples of this case. When Gottfried Wilhelm Leibnizinvented the binary system – the one that uses 0s and 1s only – in the 17th century, nobody would have imagined that this was going to be a cornerstone of computing science three centuries later. At the time it was thought of as a mathematical curiosity with not many possible applications. If we were to decide whether or not to fund his research based on the knowledge available at that time, many of us would say that it would be a waste of money. Four centuries later we cannot imagine life without a computer – and computers rely on Leibniz's discovery to do tasks ranging from downloading that new app that counts calories to safely landing a space probe on Mars.

Standing on the shoulders of giants

When Michael Faraday explored the relationship between electricity and magnetism, he had no idea how many electrical devices his discoveries would lead to. In fact, Faraday lacked the ability to express his findings in a mathematical form which would be useful for further development. It was James Clerk Maxwell who took Faraday's work and expressed it in a set of equations that represent the current theory of electromagnetism. Later, at the beginning of the 20th century, it was Nikola Tesla who invented the electric engine among other things, using

this theory. This shows that breakthroughs take time and often need to stand onto the shoulders of giants to see further.

The lesson here is that money spent on basic science doesn't always bring returns in the sense that an investment in property would, but when it does bring returns, they can represent many, many times the investment. More importantly, the return on investment is not just financial, but the knowledge also takes humanity huge steps forward.

This is not to say that we should not invest in applied science. We all need a solution to our dependence on fossil fuels for energy if we hope to leave a planet to our grandchildren. But increasing the budget for applied science research by cutting the budget for basic science research is not the right approach. Breakthroughs come from exploring the unknown – and improving what it is already known, although desirable, is not going to lead us into the next scientific revolution.

Playing the long game

The technology that we take for granted relies on a vast infrastructure that wouldn't exist without basic research that was done years, or even centuries ago, with little or no expectation of practical benefits. Basic science is a long-term investment, which might or might not yield tangible results. But when it does yield results they can lead to dramatic changes in society and expand our understanding of the universe. As with all things in life, nothing is certain, but the odds are that money invested in basic science will at some point yield something in return – and that something might be a giant leap forward.

We also need to remember that science is an enterprise of humanity as a whole, not a competition between countries or corporations. It is a global effort as a species to improve our understanding of the cosmos.

Not every piece of knowledge we obtain through science must have a practical application or serve a specific purpose other than expanding our understanding of the universe and how it works. Right now we are at the doorstep of a new era of understanding. We still don't understand dark matter (or dark energy), which makes up more than 95% of the universe. In fact the word "dark" implies how little we know about it. Who knows what new insights on the cosmos we can get by pursuing these unknowns and what potential benefits for mankind might come from trying to understand them.

As Carl Sagan once said: "We are a way for the cosmos to know itself." We must continue to strive in that direction and reap all the accidental benefits.

Source: The Conversation