

What is it?

You have likely heard terms like GMO (genetically modified organism), genetic engineering, CRISPR, and gene modification in both the media and from people in your life. But what do these terms mean, and what is the difference between them?

In short, there isn't much of a difference. Globally all these terms fall under one branch of science, **Synthetic biology**. It is one that we don't talk about much in New Zealand, but **it is the field of science which focuses on engineering, changing, and otherwise modifying living organisms to have the traits that we want them to.**

How is it used?

Globally, researchers, scientists, and policy makers use the term synthetic biology as an umbrella concept to discuss various tools. One such international example of this is 'The Convention on Biological Diversity' created by the United Nations and ratified by 196 nations. This convention defines synthetic biology and has led the IUCN (International Union for Conservation of Nature) to develop their own detailed policy on the use of synthetic biology.

In addition to this, other nations and research organisations, including universities, have and are creating their own guidelines and recommendations for the field. **In Aotearoa New Zealand, the term 'genetic technologies' is often used as a synonym for synthetic biology.**

Concerns & Debate

Ethical concerns have sparked a debate around using synthetic biology and many across the globe are uneasy about the field. **This has resulted in various terms and confusing language being used by both those for and against the use of synthetic biology (e.g., synthetic biology and genetic technology), as both sides try and push for their own ideas and technologies.**

This means that, as the debate rages, it gets harder to understand synthetic biology and its tools and how they may or may not be used in local contexts. Researchers and governments may also pivot their language if previous tools haven't been able to gain as much support as they would have liked. Changing names lets them say things like "no this is tool a, not tool b, they're different things" while ignoring that they are both synthetic biology tools, and not always as different as they are made out to be.

Why should you care?

Synthetic biology is one of the fastest growing fields of science and has implications in every aspect of our lives. The uses of this tech stretch from medicine to conservation, food, agriculture, and even energy. However, while this field has the potential to do and create incredible things, it has been accused of entering a morally grey area. In New Zealand, our history of being genetic engineering (GE) free tends to lead to people having strong and passionate opinions on these topics. More recently, the government has proposed making changes to the restrictions currently in place controlling synthetic biology tools. Education is always the best way to approach these issues, and by staying informed you can contribute to and understand these discussions, even if you aren't an expert.

What should you do about it?

To help people better understand synthetic biology, we have developed a series of short, one-page documents which dive into some of the terms and tools most frequently mentioned in the media, online, and by environmental organisations. These documents cover synthetic biology tools such as Proxies of extinct species, Gene drives, RNAi, and Transgenics. To some people, this may appear a strange selection of tools to cover, but they have been chosen because they are the tools that we keep hearing about, and because they cover a range of applications of synthetic biology. **Click on each of these to access them.**

▶▶ [Proxies of Extinct Species](#)

▶▶ [CRISPR](#)

▶▶ [Gene Drives](#)

▶▶ [RNAi](#)

▶▶ [Transgenics](#)

You can also check out these resources:

[FT014 - What is Synthetic Biology? - YouTube video](#)

[How synthetic biology could wipe out humanity -- and how we can stop it | Rob Reid - TED talk](#)

[What is Synthetic Biology? - YouTube video](#)

[IUCN Synthetic biology and nature conservation - IUCN website](#)

Disclaimer: While we are committed to being a part of these conversations regarding Aotearoa New Zealand's future in synthetic biology, Te Tira Whakamātaki are neither for nor against the use of synthetic biology technologies for environmental protection purposes. The purpose of this information sheet is to inform, educate, to break down and explain some of the different terms and tools. This tool has been selected because it is frequently in the media and mentioned to us often, not because we hold any opinion on them.