who owns what

A mildly entertaining look into intellectual property in synthetic biology

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A General Overview of Intellectual Property in Synthetic Biology: Part 1

Overview

If you're here on this blog, you are either 1) very lost or 2) looking for some information on intellectual property in synthetic biology. If you are here for the second reason, then welcome! You have come to the right place! Now begins a pseudo-entertaining journey into the realm of synthetic biology property rights.

Unfortunately, the best way to facilitate a discussion on intellectual property rights in synthetic biology is to first acquire an understanding of some key definitions (boo definitions!). Otherwise, we'll end up halfway through a discussion on the ownership battle of the gene-editing system CRISPR without fully understanding something key like "property rights."

Thus, before we begin diving into the more interesting discussions on patent law in the context of synthetic biology (which is way more interesting than it sounds, we promise) we need to establish a strong foundation in some definitions. If you're a whiz kid and you're looking at this thinking "I already have my J.D. in Intellectual Property Law with a concentration in Biological Science, why am I reading this?" you can skip to the next post in our blog and ignore this introduction. If you're reading this and are completely lost in what synthetic biology is and are wondering how you got here when you were googling a YouTube video of cats, please watch "Synthetic Biology Explained" (the link is here (https://www.youtube.com/watch?v=rD5uNAMbDaQ)) and read the 'About' page on this blog. If you don't currently know a lot about intellectual property and want to learn about it in a pseudo-entertaining way, read on to the next section!

The Definition of Intellectual Property (and Copyright and Trademark and Patent)

Before we jump into intellectual property, we should define the idea of **property rights**. Property rights grant a property owner exclusive authority to determine how a resource is used, essentially giving total power over the resource (within governmental regulations) to the owner. Property rights as a concept blankets everything from real property (land) to intangible property (ideas). One key subset of property and property rights is intellectual property, which is what we will concern ourselves with for the remainder of this post. Now with a clear understanding of property rights, here is the Google definition of *intellectual* property:

in·tel·lec·tu·al prop·er·ty

noun

LAW

1. a work or invention that is the result of creativity, such as a manuscript or a design, to which one has rights and for which one may apply for a patent, copyright, trademark, etc.

Gee willikers, what an irritatingly long and overly-complicated definition; let's break it down. In the case of synthetic biology, intellectual property is any work done by a researcher that qualifies as property and for which they can apply a patent or copyright. (You might be asking right now, "wait, why isn't trademark in your definition when it was a part of the formal definition?" Our response would be, "you actually read the whole definition?!" A trademark is a word or string of words that is legally registered to represent a legal entity. Most scientists don't trademark their names or the names of their products so this was excluded from the definition of intellectual property applied to synthetic biology.) Unfortunately, the definition of intellectual property directly references two other terms that are important to understand for the purpose of our discussion (copyright and patent), so here are their definitions followed by our analysis:

cop·y·right

noun

1. the exclusive legal right, given to an originator or an assignee to print, publish, perform, film, or record literary, artistic, or musical material, and to authorize others to do the same.
    - "he issued a writ for breach of copyright"

pat·ent

noun

1. a government authority or license conferring a right or title for a set period, especially the sole right to exclude others from making, using, or selling an invention.
    - "he took out a patent for an improved steam hammer"

Right now you're probably thinking, "holy smoke, that was a lot of definitions taken straight from Google! Why am I reading this then?" You're right, we definitely copied those definitions from the internet, but this post hopefully adds value to your internet-definition-reading-experience by providing a more in depth explanation of how all this stuff pertains to synthetic biology.

Essentially, a copyright proclaims a written or recorded piece of work (e.g. a scientific paper describing a researcher's work) as the exclusive property of whoever wrote it. In essence, you sign your name on the line next to "Author" and BAM, no one can take credit for or use your work in any way you don't want them to. But here's the catch: copyright only applies to *expressive* (creative), *nonfunctional* (has no functional purpose) work. This generates problems when researchers wish to copyright DNA sequences or tools they have discovered as opposed to a scientific article. Furthermore, the U.S. Copyright Statute does not discuss the products of synthetic biology as copyrightable material, meaning that a district court can only copyright synthetic biology products by comparing them to material mentioned in the statute, such as software. In essence, products of synthetic biology are extremely difficult to copyright because they are not explicitly mentioned in existing copyright legislation.

If copyrighting products of synthetic biology wasn't difficult enough, protecting copyrighted work presents its own problems. To legally have the power to say "don't use that" to a person infringing on your work, you must file your copyright with the U.S. Copyright Office as proof of your ownership of that work. Otherwise, if someone was using your copyrighted work, you could not sue for infringement. Fortunately, if you decide your synthetic biology product (in this case a scholarly article would work best) is suitable for copyright, registering your work with the U.S. Copyright Office is quite easy; there's even a three-step WikiHow (http://www.wikihow.com/Apply-for-a-Copyright). Clearly, copyright works best for the written products of synthetic biology, but not DNA parts. For protection of genetic parts, cloning processes and other tools, synthetic biology relies on the second of our two definitions, the patent.

In essence, a patent works in a similar way to a copyright, but patents protect functional innovations rather than *expressive* written, visual or auditory works and are always licensed by the government. To apply for a utility patent, an innovator must prove that his/her innovation is functional and **novel**, as well as provide a detailed description of all aspects of the invention, instructions for how to make it, an informal drawing, an oath that they are the original inventor, and processing fees. Right now, you may be wondering "why is the word 'novel' bolded?" to which the answer is 1) the writers like bolding words and 2) being novel is arguably the most important part of applying for a patent and is directly responsible for the ambiguity surrounding patents in synthetic biology. To be "novel," and invention must be "nonobvious" to other researchers in the same field; however, this definition has only been loosely applied in the fields of biotechnology and synthetic biology. For example, molecular cloning techniques have been widely used for decades to create plasmids and therefore products of such clonings should not be novel. Nevertheless, gene products of molecular clonings are still considered novel and therefore patentable by the Federal Circuit courts. Furthermore, new devices and systems in synthetic biology are often created from a wide variety of independently patented genetic parts, causing issue when the inventor of a new device or system using patented parts attempts to patent.

Undoubtedly, there are a lot of issues in patenting/copyrighting synthetic biology products, as almost all parts are based on an *expressive* DNA code (which indicates the use of copyright) and yet most devices created are *functional* (which indicates the use of a patent). This ambiguity in patenting and copyrighting products of synthetic biology is surprisingly similar to the issues faced in past decades by software developers. By looking at how software developers have handled the copyright/patent problem, we will define several more important terms (yay, more definitions!) and will open a dialogue on how to address intellectual property in synthetic biology.

Notes from the Writers

Over the past 5 minutes of reading time, you hopefully learned the definitions of property rights, intellectual property, copyright and patent, as well as how these definitions apply to synthetic biology. We also introduced issues of patent law in synthetic biology, a topic that will be revisited in Part 2 of this post. For ease of future reading, we are providing a "cheatsheet" of definitions as our third blog post that includes definitions from both this post and Part 2. When reading future posts, we hope that this cheat sheet will help redefine words you may have forgotten.

If you enjoyed this post and learned something from it, please comment below. If you loved all of it *except that one part* please comment below; we love feedback. If there is an issue you would like us to cover at a later date, again please comment below.

Thank you again for reading this post. We enjoyed making it as much as you enjoyed reading It!! Till next time.

Yours,

Castor and Pollux

Castor and Pollux

Representing Neptune (BU Hardware) and Gemini (BU Wetlab)

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