BIOFUTURES-iGEM Presentation on Synthetic Biology

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---------- SLIDE: OPENING SLIDE----------

Good evening everyone.

If you can't remember, I'm Akash and now, I'm going to take you through a tour of a very exciting field of Science called Synthetic Biology. The term looks really bombastic and I m sure after listening to this you'll be able to boast about the fact that you know something about synthetic biology.

So, first of all, what is synthetic biology?

---------- SLIDE: WHAT IS SYNTHETIC BIOLOGY ----------

Synthetic biology is essentially biology from an engineering perspective.

Relies upon a very important concept known as "Bio-Bricks". Sounds strange isn't it?

Let's think about this.

A builder builds a house with bricks.

It doesn't matter exactly which specific brick it is, it's just a brick.

I should be able to swap bricks between two houses and it should not make too much of a difference.

Much like how we use bricks to build a house, we can have `BioBricks' to make a biological system. In simple words, a "bio-Brick is a piece of DNA that has characteristic function.

As an example, we all have heard about Bt cotton right?

It has been genetically modified with DNA from bacterium bacillus thuringeinsis.

DNA is Biobrick. You can combine it with another piece of DNA that gives the plant ability to grow in arid conditions. Then we are combining those two bio bricks together. This is the concept of Biobricks.

So from this example we can see biological functions as `bricks' that we can move around and join in different combinations to create new functionality and the characteristics.

---------- **SLIDE: WHY STUDY SYNTHETIC BIOLOGY?** ----------

The solutions to many problems that we face today like global warming, increasing antibiotic resistance, energy crisis, increasing plant diseases etc. transcends the individual boundaries of any particular discipline in science. We all know about this on-going kind of a cold war between various disciplines in science Yes? The most common example is physicists and biologists.

Physicists think biology is crap and has no logic and the discoveries made were solely due to advancements in technical improvements with instruments. Biologists on the hand think that if the observations made with help of instruments were not pondered upon then we wouldn't have come to the conclusions. This goes on and on and finally the conversation ends when biologist say, The next time you fall ill try curing yourself with your instruments and applying all the laws in physics. Then when everything's over Mathematicians come along and they are like I still have my case to present. Then physicists and biologists are like get out. Mathematicians are like Screw You Physicists and Biologists. Math is the mother of all sciences.

Some smart guy must have thought that is preposterous and this way none of our problems will get solved. So we need principles and ideas from all the disciplines to address the problems. This is how SYNTHETIC BIOLOGY was born!

So, as we can guess, synthetic biology is the convergence of many disciplines including biotechnology, engineering, biomedical sciences, bacteriology and environmental science.

Many of the most amazing scientific discoveries are made when analysed from the perspective of multiple fields of study, and synthetic biology is not different. As an example, structure of DNA discovered by Watson, Crick Franklin and Wilkins. They used physics, chemistry and biology to come up with that structure.

Through synthetic biology, we have the potential to further and test our understanding how natural biological systems differ from synthetic ones thereby elucidate the interaction of genes and molecules within the cell.

We shall go through a few potential problems to tackle with synthetic biology a little later, but you can probably imagine that synthetic biology holds a lot of potential to transform current scientific thinking.

---------- **SLIDE: WHAT IS iGEM?** ----------

So now that we know something about synthetic biology you might wonder why am I being a student talking to you about synthetic biology? Well, the answer I m working on a synthetic biology project with 5 other students 3 of whom are present here, Ann Aakash and Josh. We are guided by academics from various fields.

The project is a part of a competition run by MIT-USA. It is known as iGEM- International Genetically Engineered Machines.

The competition is for undergraduates from all disciplines and we compete with about 150 other teams from around the world, with 2 teams from Australia and UQ is one of them.

---------- SLIDE: WHAT IS THE PURPOSE OF iGEM? ----------

So iGEM does sound like a lot of fun and games, but there is a serious purpose (laugh/ smile).

1. The goal of iGEM is to promote the education of not only the new field of synthetic biology, but also the education of science around the world.

2. Build up a repository of biobricks that have different functionality, which everyone can use for applications only limited by their creativity! Therefore, all the biobricks that are made by us and other iGEM teams are submitted to the Registry of Standard Parts. This is an open-source library of Biobricks whose purpose is to be a collection of resources for anyone to use.

3. To develop new ideas to tackle problems

---------- SLIDE: WHAT IS UQ DOING FOR iGEM? ----------

Now you might be curious about what is out project based on? We are trying to replicate the biological clock in a bacterial system.

In humans, this 'clock' is also known as the circadian rhythm or the circadian cycle. This is what regulates a number of very important processes. This what wakes you up in the morning and makes you go to sleep at night, attend the natures call every or afternoon depends on your cycle to be honest, controls time when you'll be hungry during the day etc.

Using this principle of a twenty-four hour clock, which consistently fluctuates to regulate our bodily processes, we are trying to construct a network of genes that will oscillate in a similar fashion.

If we are successful, we will be able to put different genes into our system so that we can make the bacterial system perform a particular process at regular intervals.

A simple example of this would be to make them flash periodically.

In the end, this technology could have applications such as regular release of drugs into the bloodstream so that patients who are incapable of administering the drugs themselves are not at risk.

---------- THIS IS ALL I'VE GOT THANK YOU----------