strange NATURE

STUDENT
RESOURCES

2015

THE UNIVERSITY OF SYDNEY

The Strange Nature competition will comprise of two separate competitions: written and multimedia. Students are asked to answer the question:

"Identify a current biological, environmental, or medical issue and discuss a genetically modified organism that might provide solutions"

Written - Students are asked to submit a maximum of **1000 word** piece of writing in a style of their choice addressing the question above. Submissions are on an **individual basis**.

Multimedia - Students are asked to submit a video, podcast, documentary or any other video media in a style of their choice addressing the question above. The maximum length of the entry is limited to 5 minutes. Submissions are to be completed as a **team** consisting of between **2 to 5 students**.

Prizes - The winning entry of each competition will be awarded $500.00 and the first runner up of each competition will receive $250.

Please note that the prize money will be split evenly amongst the members of the winning team in the multimedia section (i.e – if the winning team consists of 5 members then each individual member will receive $100).

The winning pieces will be engaging, well explained, and demonstrate research, understanding and imagination. This means entries include only established science or a logical extension of established science. The best entries will clearly show an understanding of genetics and synthetic biology, as well as engaging with ethical, technological, environmental or social issues that may arise in the future.

To assist you in your research and submission we have put together a list of possible problems you can address and a real world example of a genetically modified organism created to solve such an issue.

Possible topics include –

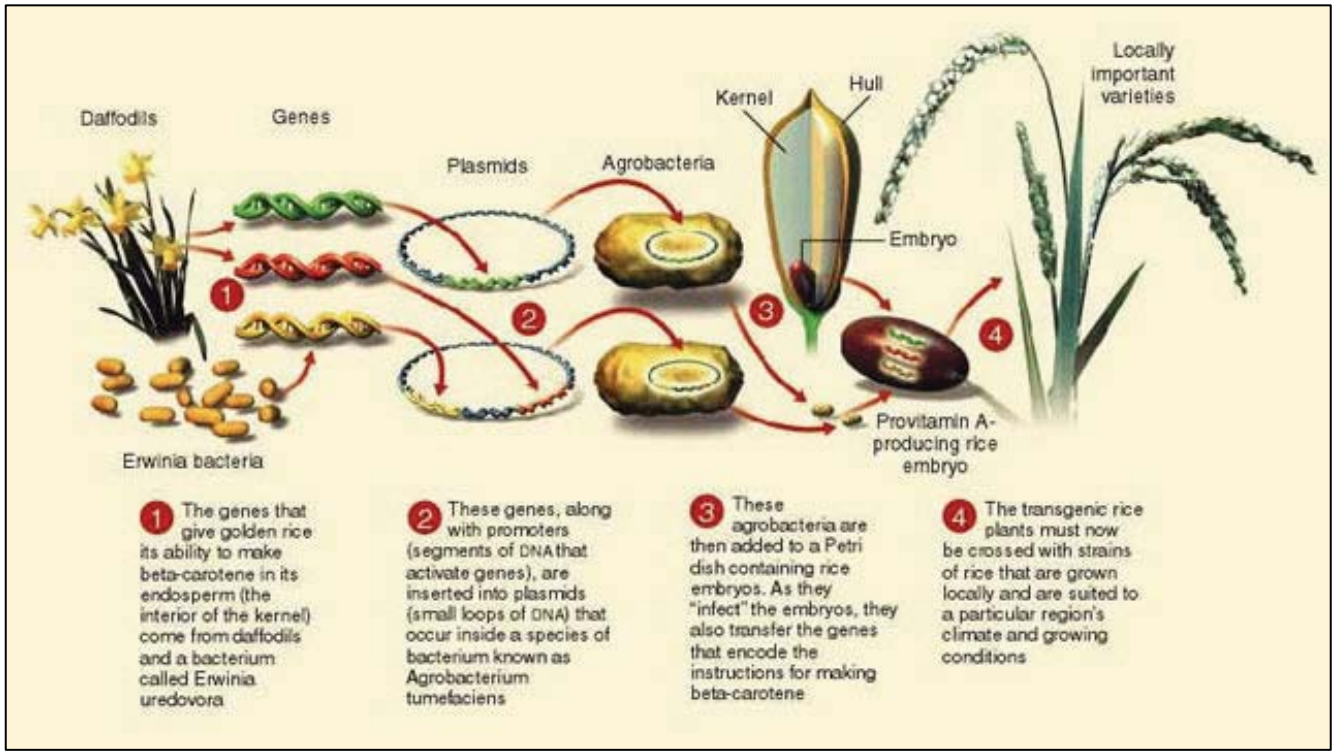
- Climate change
- Decreasing CO2 emissions
- Increasing severity of droughts resulting in less water for plans
- Infertile and arid soils
- Food shortage
- Antibiotic resistance
- Insects and other pests destroying crops
- Malaria, HIV and other infectious diseases
- Shortage of organs available for transplant
- Detrimental use of pesticides
- Plastic in landfills and waterways
- ... Or feel free to suggest your own

An example of a GMO at work: **Golden Rice**

The Problem: Thousands of children in developing nations are deficient in Vitamin A. Vitamin A is found in carrots, apricots, kale and many other foods and is essential for proper growth and development, a strong immune system and good vision. These plants are scarce in the third world as they are low in demand and expensive to produce. As a result of this deficiency, annually half a million children develop Cataracts, a condition where the lenses of they eyes becomes opaque leading to blurred vision and blindness. This is an extremely preventable disease that is rare in the developed world, due to good nutrition.

The Solution: The crop rice is grown across the third world, it is easy to grow and easily accessible to citizens with a Vitamin A deficiency. Thus, scientist Ingo Potrykus from Switzerland and Professor Peter Beyer from Germany inserted the Vitamin A gene into the rice genome meaning this crop produces rice high in Vitamin A and is currently undergoing field trials in the Philippines. Golden Rice itself is not expected to solve this Vitamin A deficiency problem as other factors such as poverty, lack of infrastructure and lack of education but it is certainly making a credible difference.

Golden Rice shown on the left and non-transgenic rice shown on the right (source: http://www.allowgoldenricenow.org/the-case-for-golden-rice)



The process used to create Golden Rice (source: http://www.isaaa.org/Kc/inforesources/biotechcrops/The_Golden_Rice_Technology.htm)

For more information about Golden rice see:

http://www.goldenrice.org/index.php
http://www.goldenrice.org/PDFs/The_Golden_Rice_Project_Mayer_et_al_2006.pdf
http://www.allowgoldenricenow.org/the-case-for-golden-rice
http://www.isaaa.org/Kc/inforesources/biotechcrops/The_Golden_Rice_Technology.htm

As you can see from this brief introduction to Golden Rice, scientists identified a problem and used synthetic biology to provide a solution. We want you to do the same, engage with a current and prevalent issue and think of how synthetic biology could be used to create a genetically modified organism that could solve the issue. We do not want you to use existing GMOs but rather invent your own by researching special properties and genes of various organisms. We encourage you to look at a wide range of organisms including animals, plants, microbes, viruses, and bacteria. There are thousands of unknown plants and microbes that possess novel properties and characteristics that can be utilized by scientists to create GMOs. We encourage you to find such organisms and use your imagination in finding a use for such novel genes.

Here are some useful websites on synthetic biology and genetic engineering –

https://www.ted.com/talks/pamela_ronald_the_case_for_engineering_our_food
http://www.synbioproject.org/topics/synbio101/
http://www.csiro.au/en/Research/Farming-food/Innovation-and-technology-for-the-future/Gene-technology/Genetic-modification

For more information on the iGEM competition and the University of Sydney 2015 team please see:

https://www.facebook.com/pages/The-University-of-Sydney-IGEM-Team-2015/425435970963120
https://www.igem.org/Main_Page
http://2015.igem.org/Team:Sydney_Australia

Good luck!

Rules and regulations –

The competition opens on the 5/7/2015 and closes on at midnight on the 5/10/2015, unless specifically told by the Promoter, any entries submitted after the deadline will be deemed invalid and will not be considered.

All work submitted must be original and the work of the individual or team. If addition sources are used in the research phase then they must be acknowledged and cited inline with an approved referencing system.

By submitting an entry, entrants consent to the Promoter using the entrant's winning entry (either in full or in part), name, likeness, image and/or voice in the event they are a winner (including photograph, film and/or recording including to reproduce or publish such material in any medium) for an unlimited period without remuneration for the purpose of promoting this competition (including any outcome). Such information will only be used in specific relation to Strange Nature and will not be shared to irrelevant third parties.

The Promoter is the University of Sydney iGEM Team of 2015.

For the full terms and conditions see www.strangenature.org