Visualising

Synthetic Biology

CLONING[A]

RECOMBINATION[B]

TRANSFORM[A C]

+ SELECT[A B C]

GROWTH[C]

We can synthesize complex molecules (proteins) by inserting DNA (that codes for said molecule) into living cells to create the molecule of our choice. By introducing DNA into the cell, we use the organism's own biological processes to synthesize molecules of our choice, essentially using it as a living factory. The DNA introduced will be transcribed into mRNA and then translated into an aminoacid chain like every other protein in the cell.

CLONING

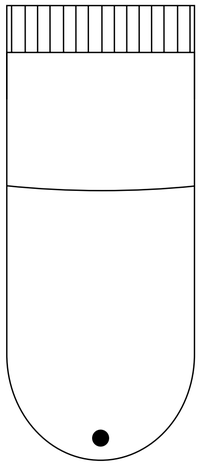
A ⇩

RECOMBINATION

TRANSFORM

+ SELECT

GROWTH



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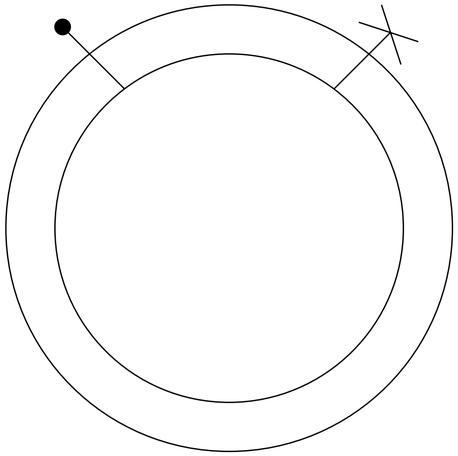

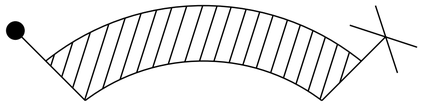

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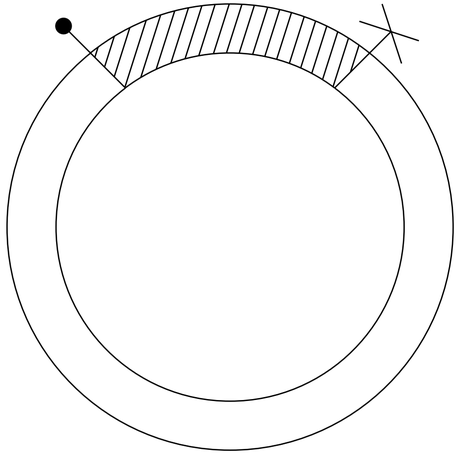


3

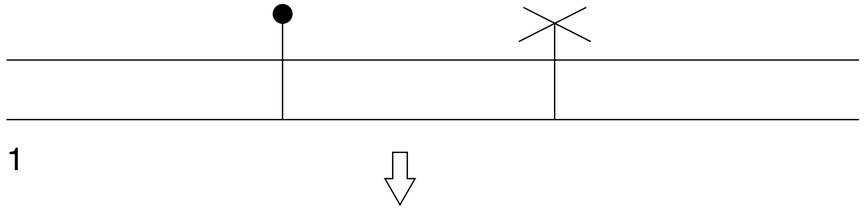
1 original plasmic (circular DNA) in gel inside a test tube
2 new gene to be inserted
3 synthesized plasmic inside gel

Cloning takes place outside of the cell. The cutting and attachement of your chosen gene happens inside a solution which is then later reintroduced to the cell.

CLONING
RECOMBINATION

B

TRANSFORM
+ SELECT
GROWTH



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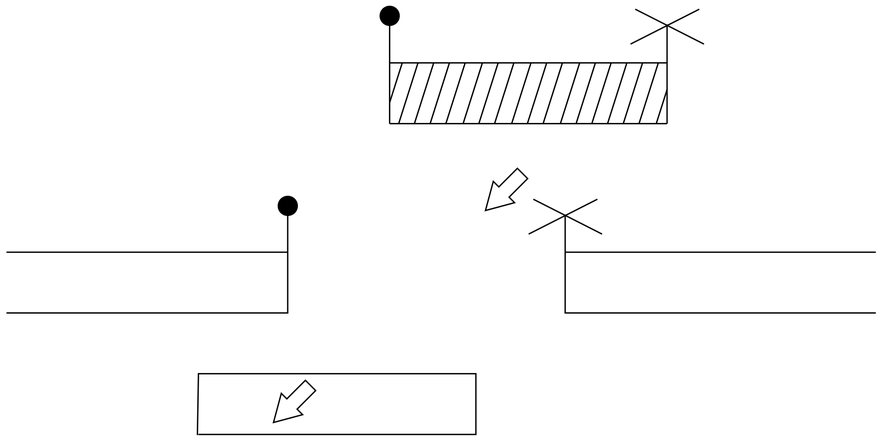

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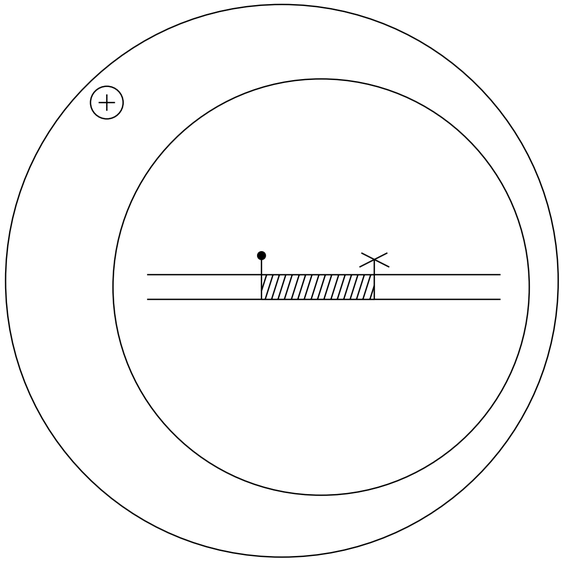


3

1 original plasmic (circular DNA) inside cell
2 part of the original DNA is cut out (crispr) and selected gene is inserted
3 synthesied plasmic inside nucleus > cell

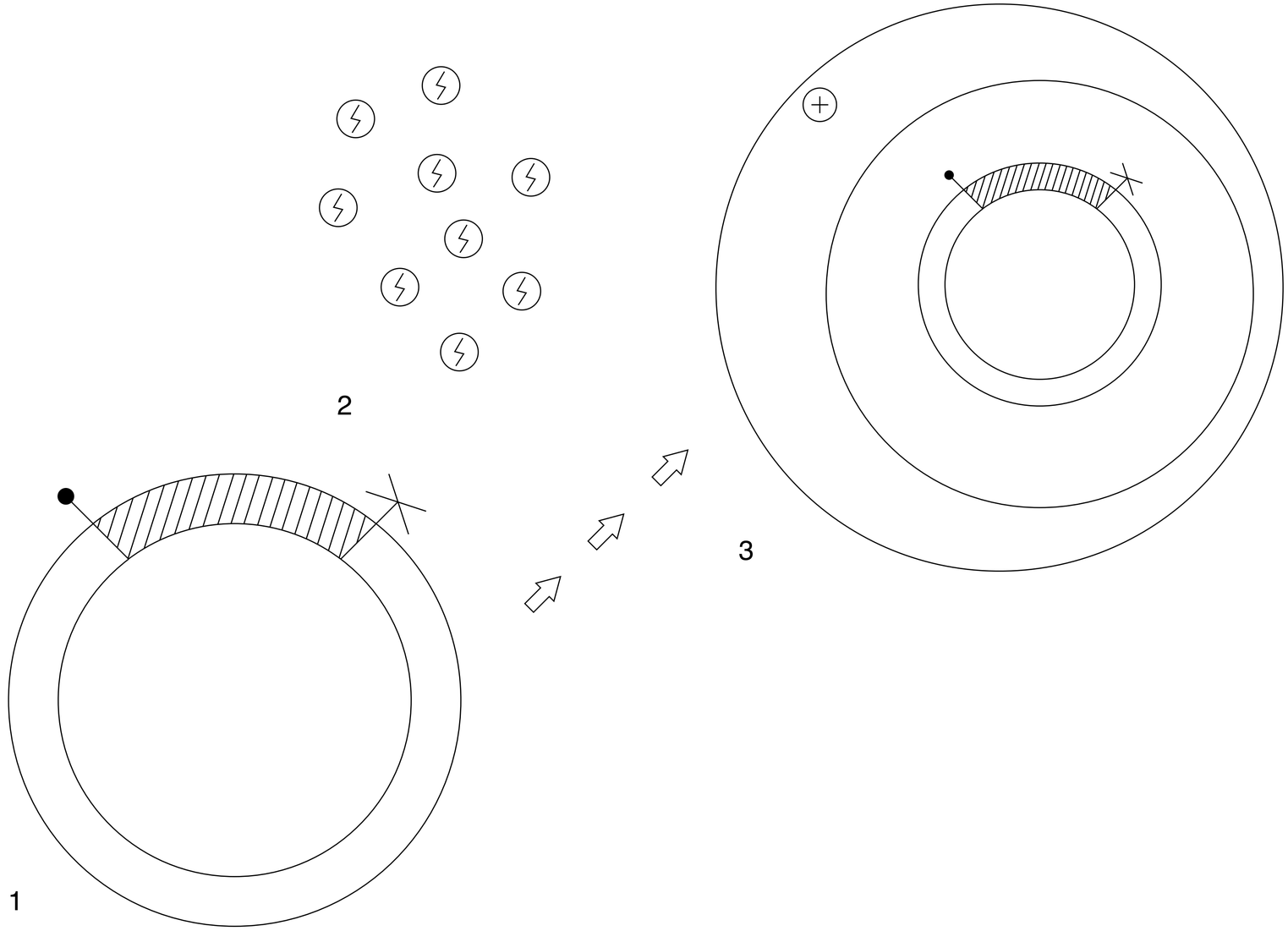
Recombination is a relatively new tech where you make a precise incition into the nucleus, cut a section out of the DNA and attach your strand of DNA. This is commonly done with ‘crispr.’

CLONING
RECOMBINATION
TRANSFORM

A C ⇩

+ SELECT

GROWTH



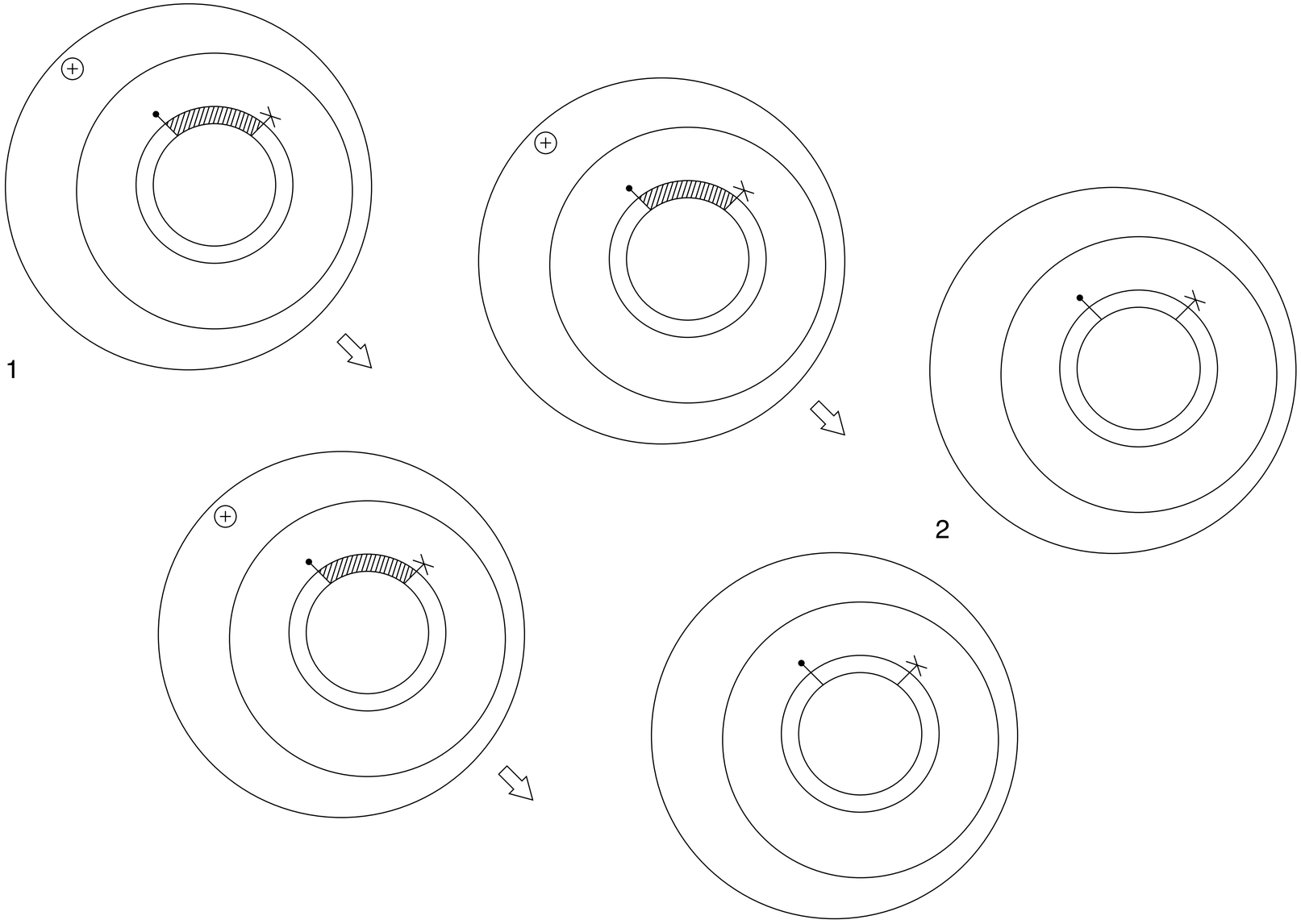
1 synthesized plasmic (circular DNA) outside of cell
2 zap of electricity
3 synthesied plasmic inside nucleus > cell

Cloning and Growth both go through this process as the DNA was synthesized outside the cell. To put the synthesized DNA back into the cell you zap it with electricity called electroporation.

CLONING
RECOMBINATION
TRANSFORM
+ SELECT

A B C ⇩

GROWTH



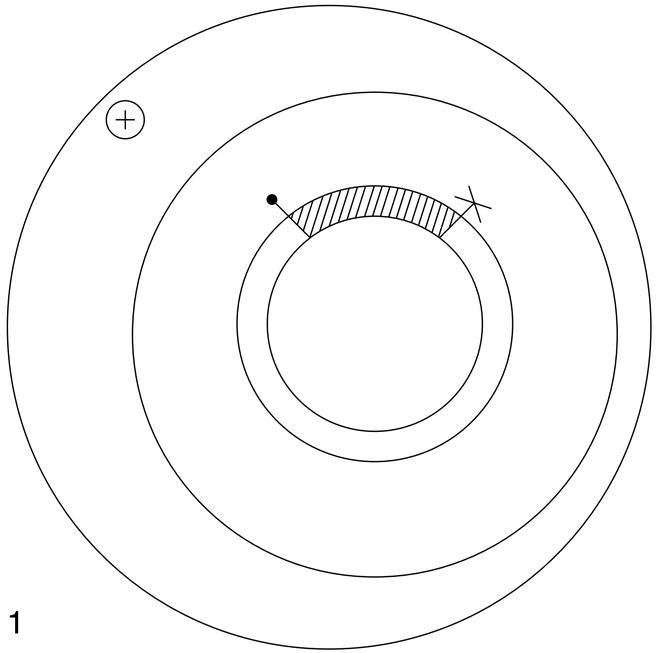
1 synthesized cells
2 unsynthesized cells

Cloning, Recombination, and Growth go through this process of Select. Genetic engineering can be inefficient so the point of selection is just to select the desired traits. This is done by inserting a selective feature next to your introduced gene into the plasmic (circular DNA) Because so much is going on you want to remove as much as possible so less is interfearing with your data. An example of this could be putting an adapting gene into the synthesized cellls where as the un-synthesized cells don't have.

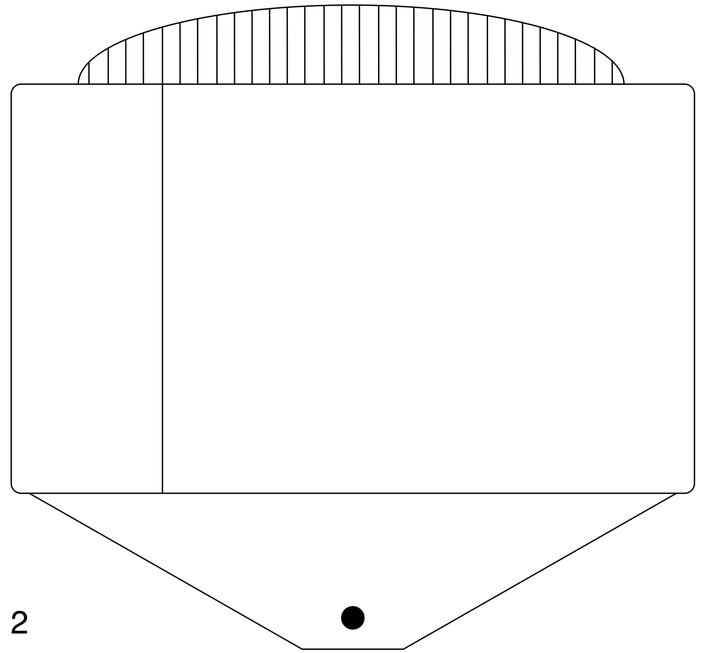
CLONING
RECOMBINATION
TRANSFORM
+ SELECT

GROWTH

C ⇩



1



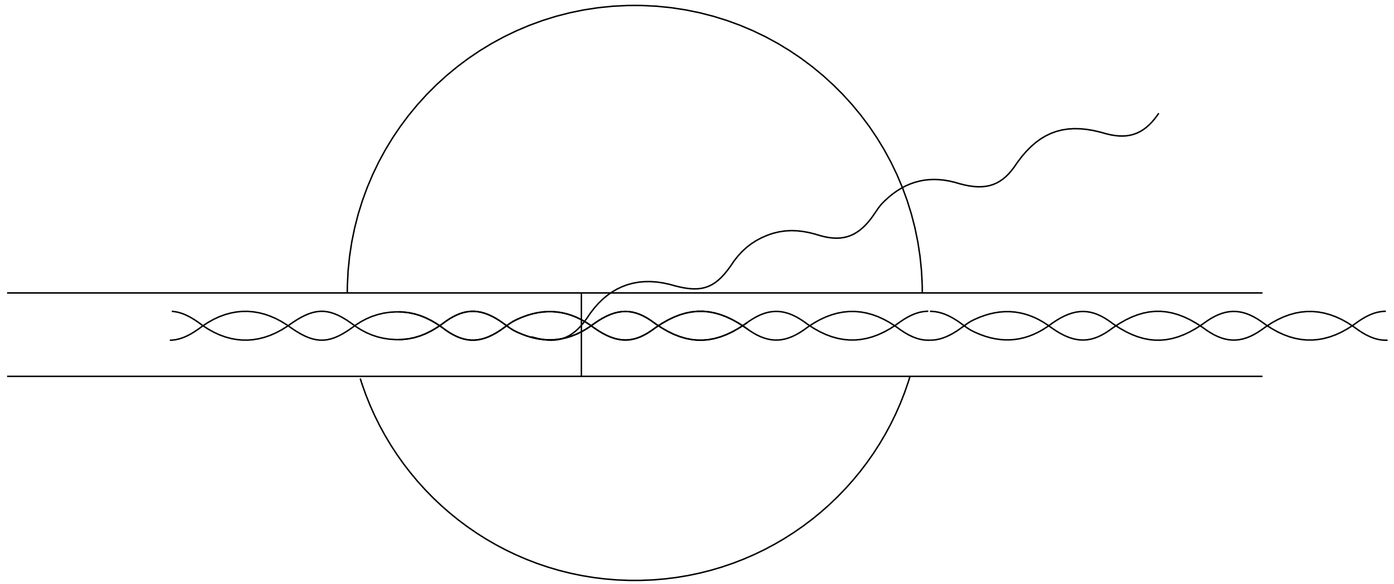
2

1 synthesized cell
2 controlled environment

After you have your newly synthesized cell, Growth can happen. Like selective breeding, the synthesized cells will benefit from growing in a controlled environment and multiply.

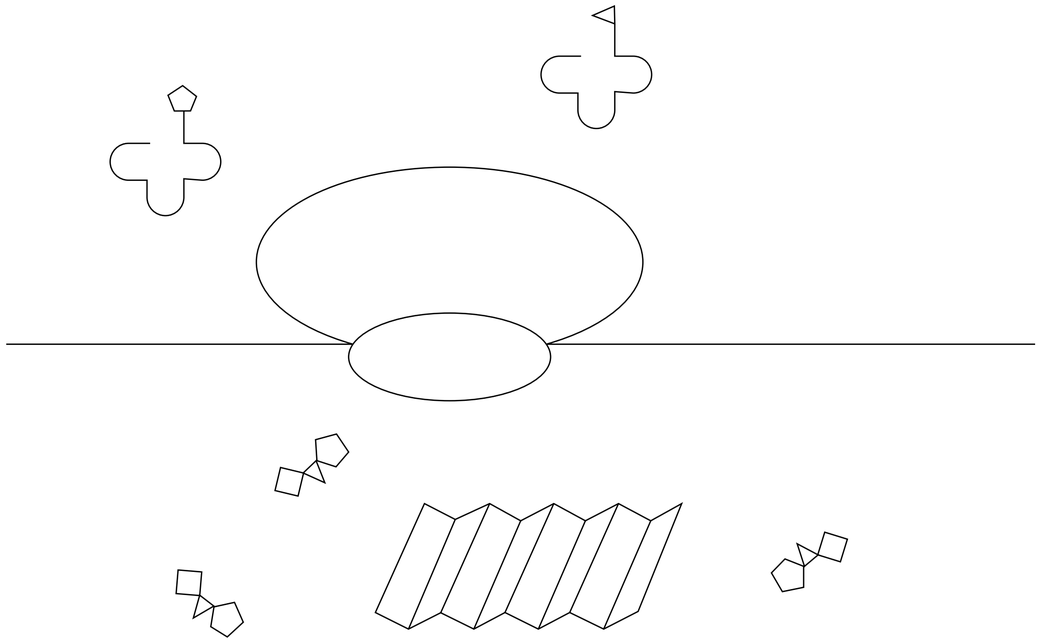
CELL PROCESS

1

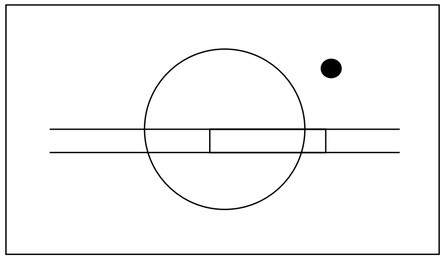


The DNA is inside the nucleus of a cell. Coming out of the cell is an mRNA strand leaving the nucleus to create protein.

NEW FUNCTION



Here is a close-up of just outside the nucleus. The mRNA strand is transcribing aminoacids that will become a chain of 20 aminoacids before folding onto itself becoming a protein structure. The protein is the new function.



DNA STRUCTURE

This is a molecular geometric structure of DNA. These bars interwined in the double-helix shape of DNA are called nucleotides.
It is important to understand the molecular structure of DNA because that is the language of life. To create something biological you are trying to produce some sort of molecule and understanding this biological language allows you to begin to understand how everything works and how to use this information to your advantage.