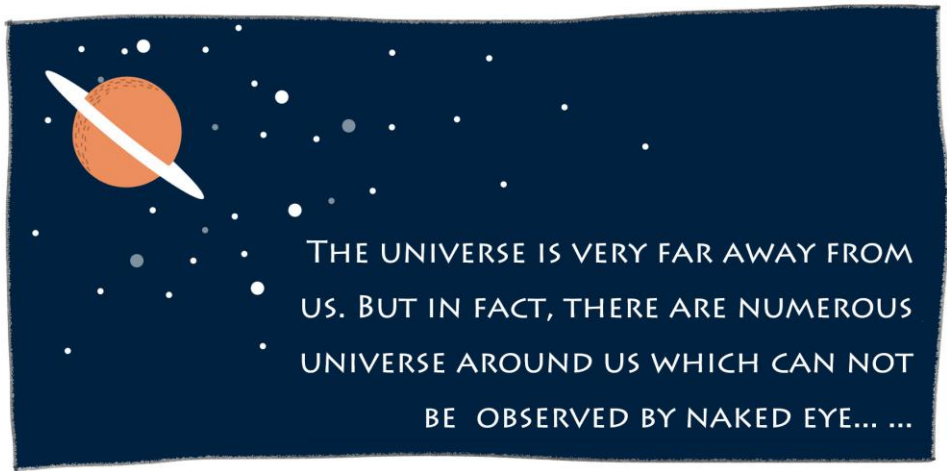


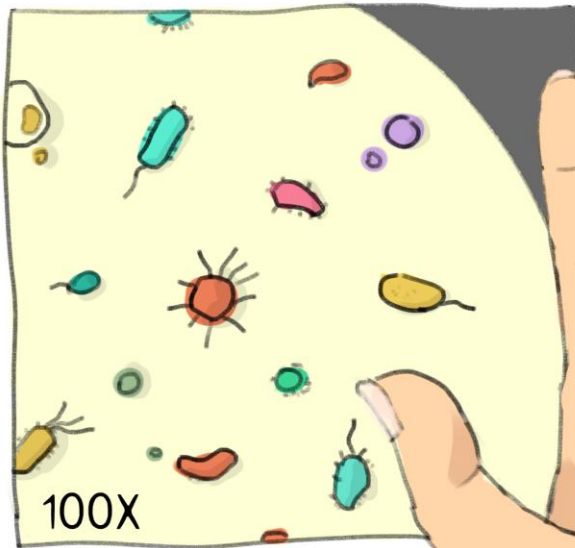
Chapter 1

DAILY IN SPACE SHIP

E.coli



THE UNIVERSE IS VERY FAR AWAY FROM
US. BUT IN FACT, THERE ARE NUMEROUS
UNIVERSE AROUND US WHICH CAN NOT
BE OBSERVED BY NAKED EYE... ..

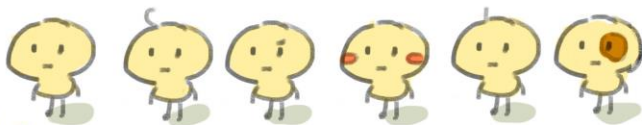


FOR EXAMPLE, YOU CAN ZOOM
IN ON YOUR FEET TO A SUFFI-
CIENT NUMBER TO OBSERVE, AND
YOU CAN OBSERVE THOUSANDS
OF TINY LIVES BACTERIA.
BACTERIA ARE EVERYWHERE, PRO-
DUCING LARGE AND SMALL 'UNI-
VERSE SYSTEMS'.

AND TODAY WE ARE INTRODUCING THE
UNIVERSE THAT SYNTHETIC BIOLOGISTS
HAVE STUDIED..



**NEWCOMERS! YOU WILL
BE ONE OF THE CREWS IN
OUR SPACESHIP. I'LL TELL
YOU BASIC SITUATION OF
OUR SPACECRAFT AND
YOUR SPECIFIC WORK!**



**THIS IS WHERE YOU
ARE NOW, SPACE-
CRAFT E.coli!**

THE SPACESHIP IS MADE BY THE BACTERIA SPACE-CRAFT COMPANY, AND THERE ARE MANY KINDS OF SPACE SHIP! E. COLI IS ONE OF THE MOST WIDELY USED SPACE SHIPS!



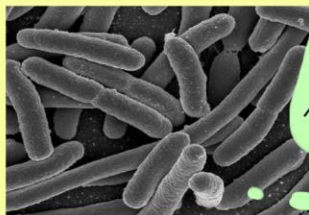
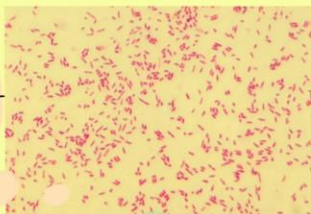
DRIVING SPACESHIP IN THE UNIVERSE AND PERFORMING A VARIETY OF TASKS IS OUR DUTY!



Tip:

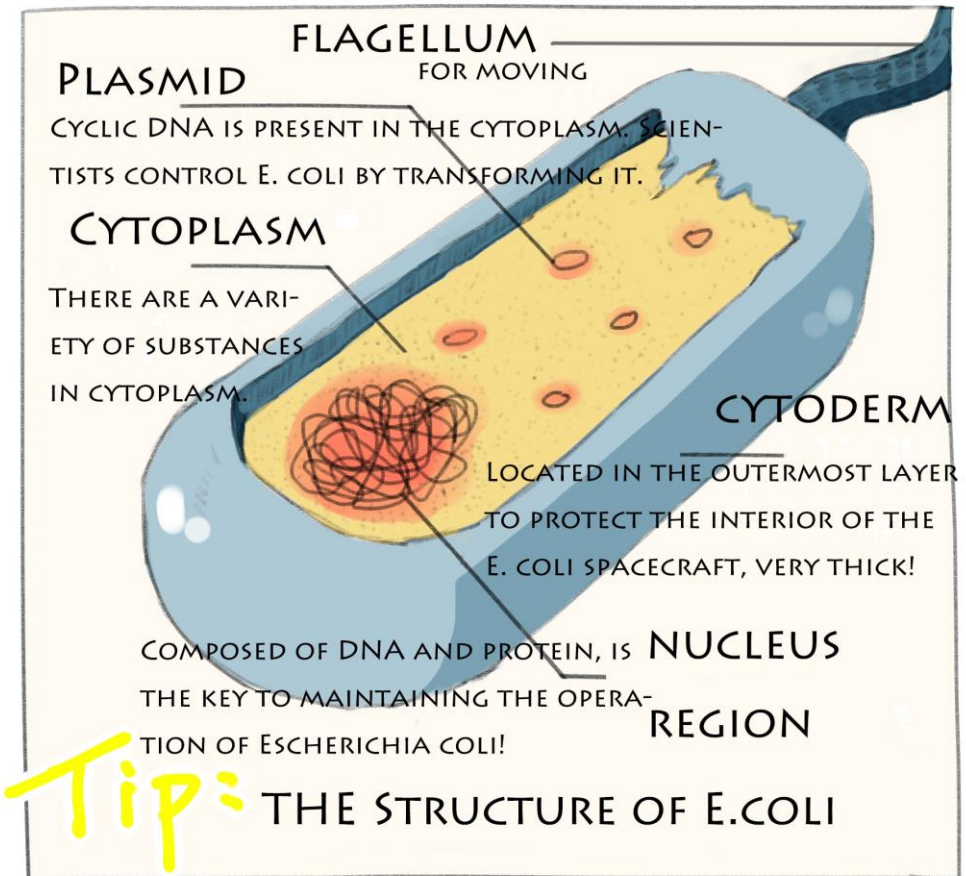
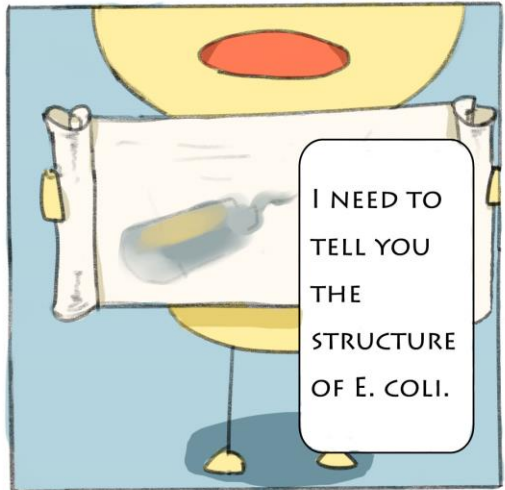
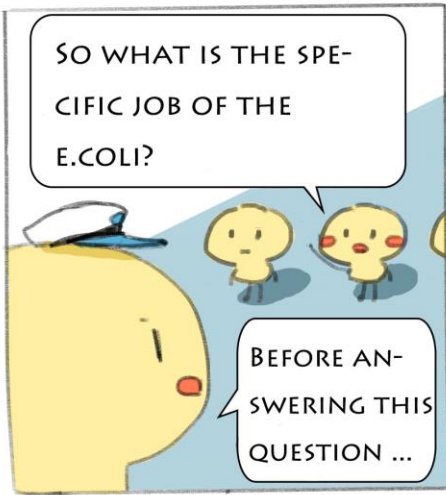
WHAT DOES THE REAL E.COLI LOOKS LIKE?

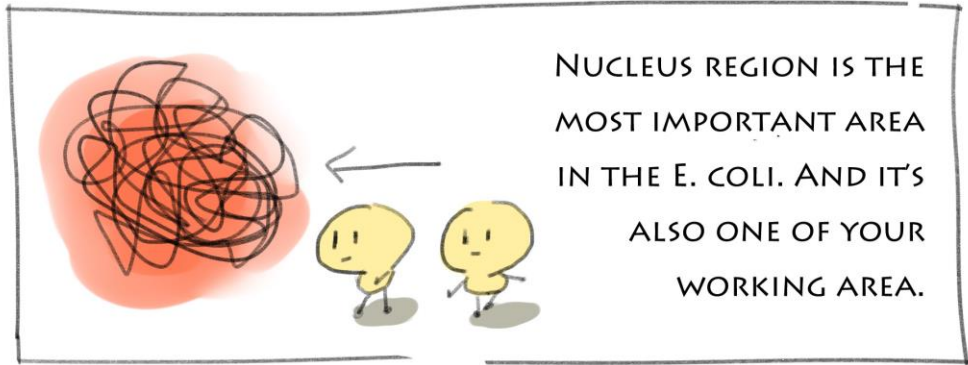
E.COLI UNDER THE OPTICAL MICROSCOPE.



E.COLI UNDER A MORE ACCURATE MICROSCOPES.

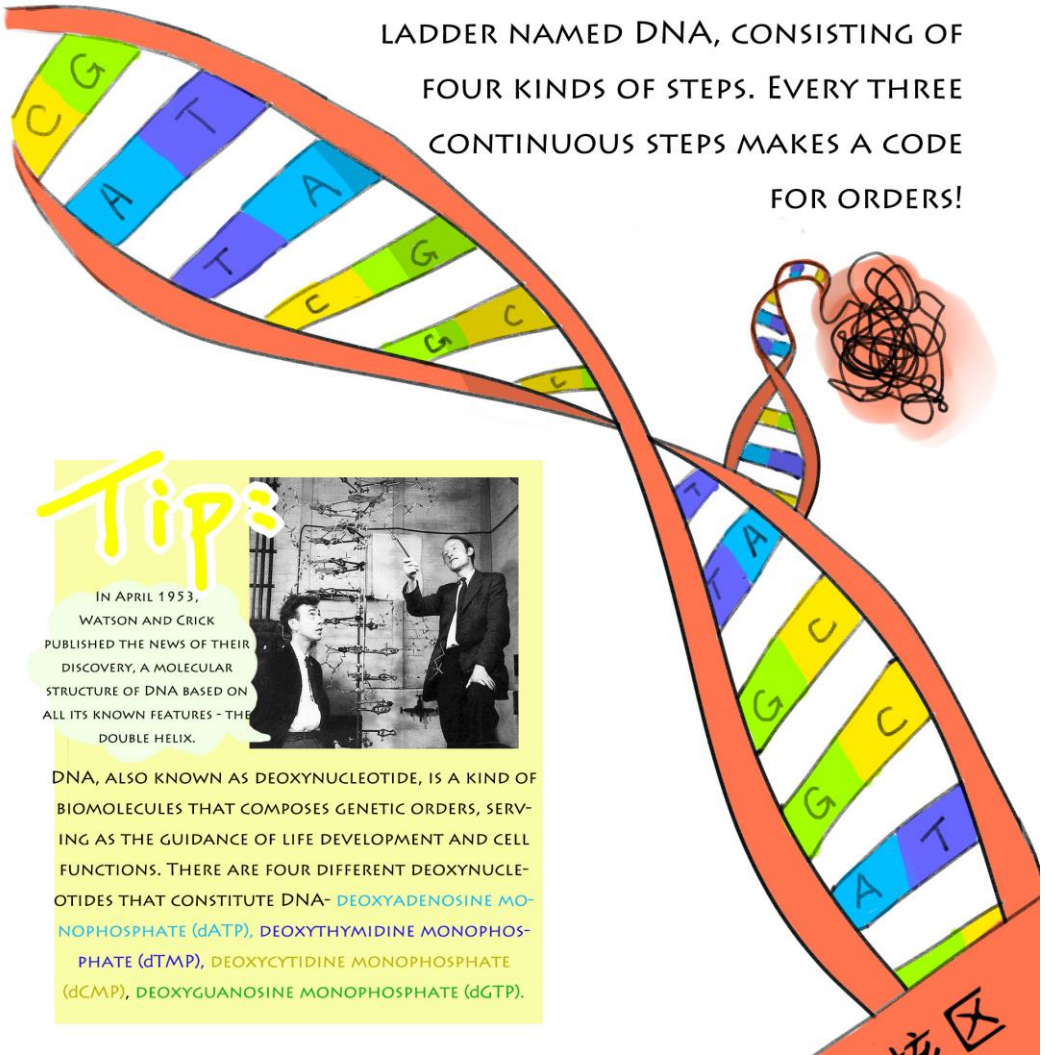
THIS IS THE WORKPLACE WHERE A LOT OF SYNTHETIC BIOLOGISTS WORK IN, MOLECULAR BIOLOGY LABORATORY! E.COLI IS EASY TO CULTIVATE AND BREED QUICKLY SO IT IS ONE OF THE MOST COMMON EXPERIMENTAL MATERIAL.





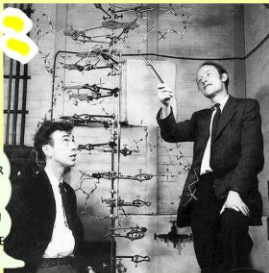
NUCLEUS REGION IS THE MOST IMPORTANT AREA IN THE E. COLI. AND IT'S ALSO ONE OF YOUR WORKING AREA.

IN THE NUCLEUS REGION THERE IS A LADDER NAMED DNA, CONSISTING OF FOUR KINDS OF STEPS. EVERY THREE CONTINUOUS STEPS MAKES A CODE FOR ORDERS!

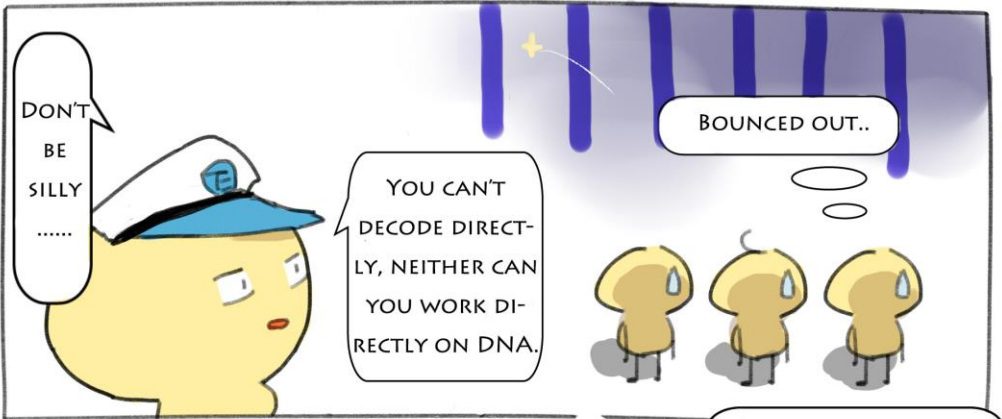
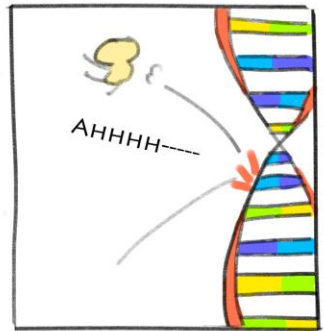
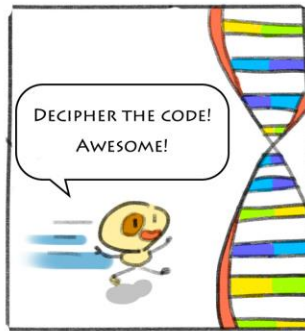
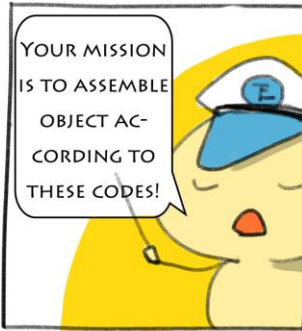


Tip:

IN APRIL 1953, WATSON AND CRICK PUBLISHED THE NEWS OF THEIR DISCOVERY, A MOLECULAR STRUCTURE OF DNA BASED ON ALL ITS KNOWN FEATURES - THE DOUBLE HELIX.

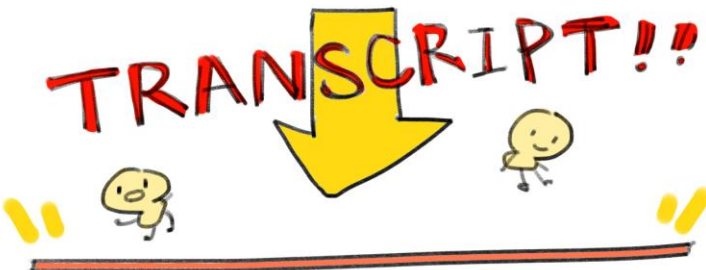


DNA, ALSO KNOWN AS DEOXYNUCLEOTIDE, IS A KIND OF BIOMOLECULES THAT COMPOSES GENETIC ORDERS, SERVING AS THE GUIDANCE OF LIFE DEVELOPMENT AND CELL FUNCTIONS. THERE ARE FOUR DIFFERENT DEOXYNUCLEOTIDES THAT CONSTITUTE DNA- **DEOXYADENOSINE MONOPHOSPHATE (dATP)**, **DEOXYTHYMIDINE MONOPHOSPHATE (dTMP)**, **DEOXYCYTIDINE MONOPHOSPHATE (dCMP)**, **DEOXYGUANOSINE MONOPHOSPHATE (dGTP)**.



DNA: THE RIBOSOME CANNOT WORK UP HERE.

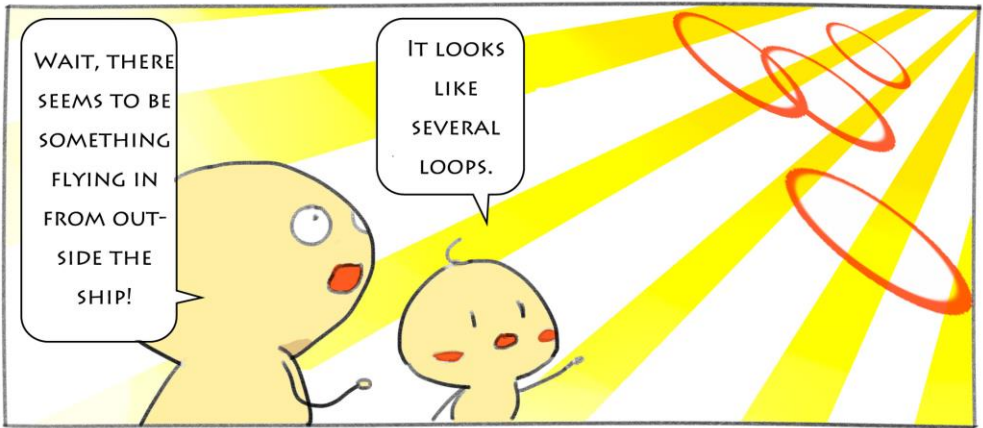
FIRST OF ALL, YOU NEED TO ASK FOR HELP FROM MR.ENZYME!



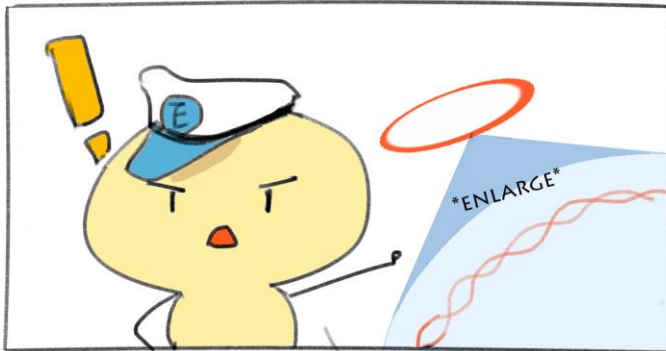
RNA: MR.ENZYME WILL FIRST TRANSCRIPT THE CODE ON DNA. THE RIBOSOME CAN THEN WORK ON IT!



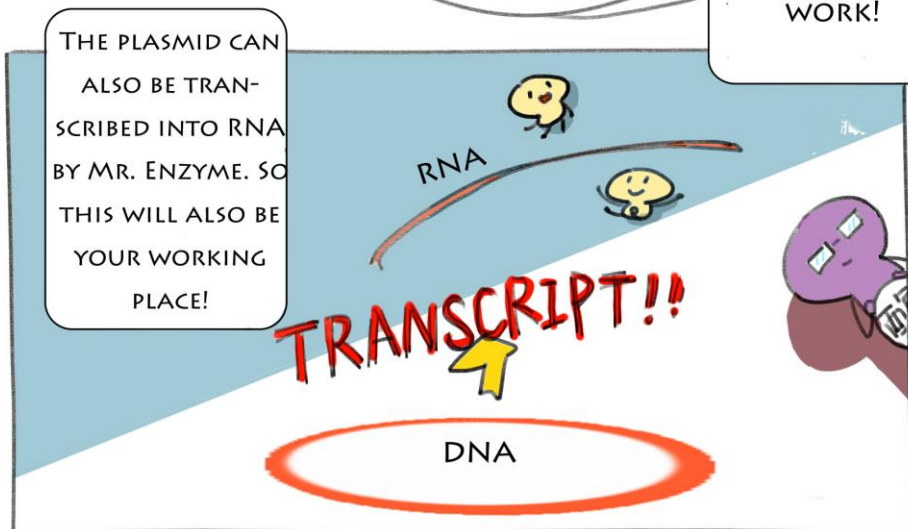
MR.ENZYME
FROM ITERATURE
DEPARTMENT



(PLASMID IS ALSO CONSISTS OF DNA. FOR DETAILS, PLEASE MOVE TO PAGE FOUR.)

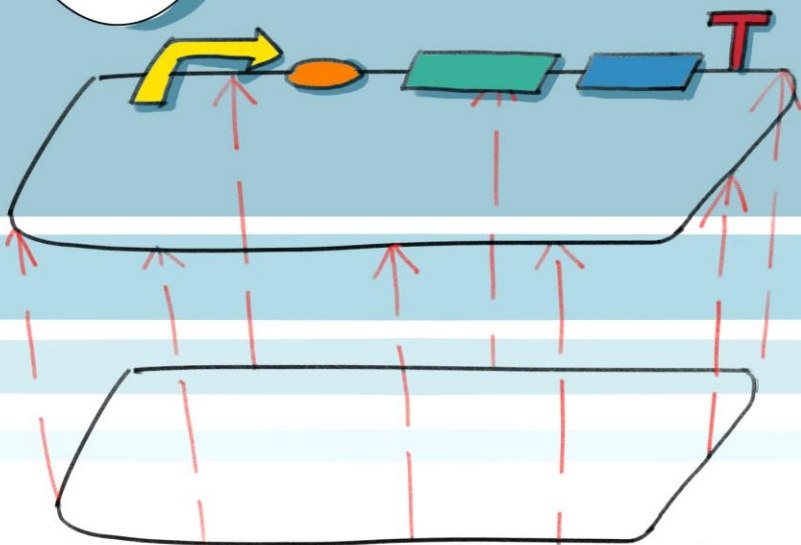


THIS IS WHAT WE CALLED "PLASMID".
COME ON, GUYS!
LET'S GET TO WORK!

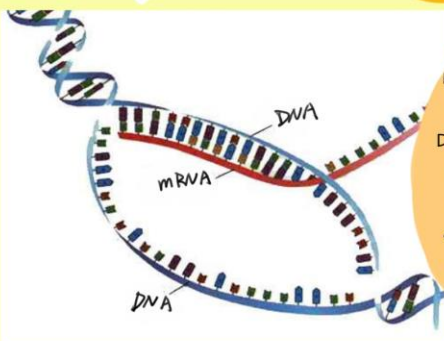


GET TO
WORK!

EVERY CODE IS CORRESPONDING
WITH ITS FINAL FUNCTION.

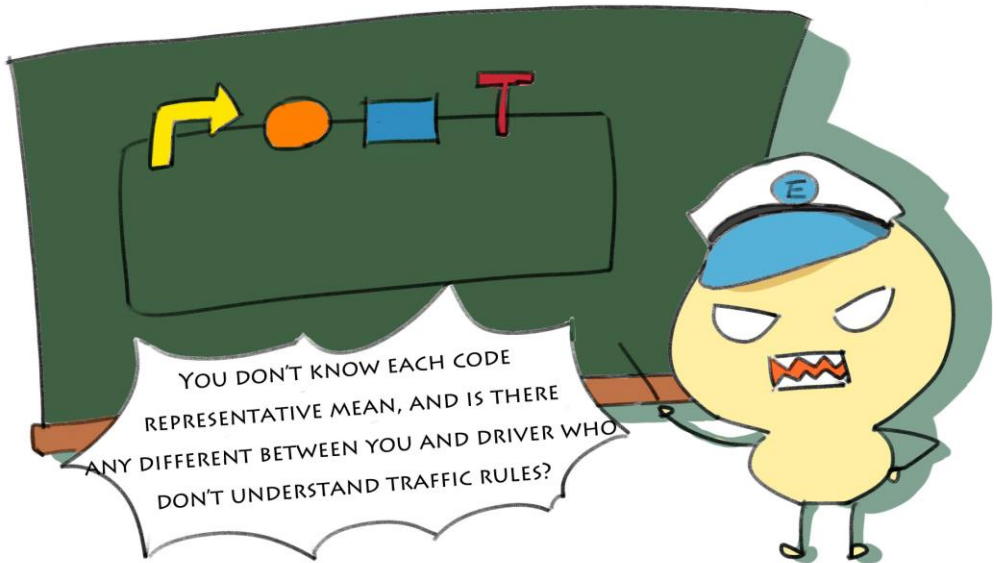


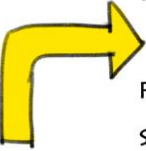



Tip: TRANSCRIPTION



THE TRANSCRIPTION PROCESS IN LIVING CREATURE IS RATHER COMPLICATED. IT NEEDS INTERACTION BETWEEN VARIOUS ENZYMES. IN PRESENT OF DNA HELICASE, TWO STRAINS OF DNA SPLIT AND REFORM mRNA WITH THE HELP OF RNA POLYMERASE. THE REASON mRNA POSSESS THE SAME INFORMATION AS DNA IS THAT IT IS CONSIST OF FOUR KINDS OF NUCLEOTIDE, SIMILAR TO THAT IN DNA. WHEN SYNTHESIZING mRNA, THESE FOUR NUCLEOTIDE WILL PAIR WITH THEIR COMPLEMENTARY DEOXYNUCLEOTIDES.

THERE IS ANOTHER PHENOMENON IN LIVING CELLS CALLED **REVERSE TRANSCRIPTION**, IN WHICH mRNA CAN BE TRANSCRIBED TO DNA. THE NOTORIOUS AIDS VIRUS-HIV IS A TYPICAL RETROVIRUS.

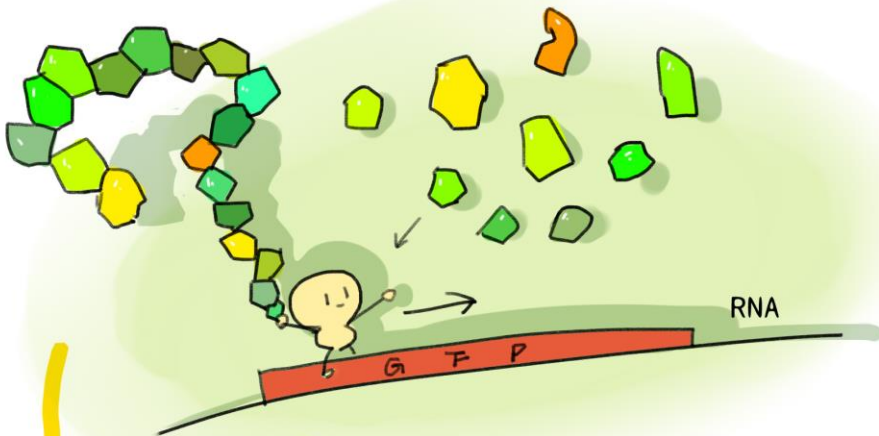


- PROMOTER**
 THEY WHICH HAVE DIFFERENT STRENGTH ARE A SYMBOL OF GETTING STARTED TASKS.
- GENE**
 THEY HAVE UNLIKE CODE TO SYNTHETIC DIFFERENT PROTEIN, RESPECTIVELY.
- RBS**
 AS AN INDISPENSABLE ELEMENT IN *E.coli*, THEY HAVE DIFFERENT STRENGTH.
- TERMINATOR**
 AS A STOPPING TASK SYMBOL.

GENES ARE DIVERSE, AND
EACH GENE HAS DIFFERENT
CODE.

GFP

GFP= GREEN FLUORESCENT PROTEIN IS A KIND OF PROTEIN,
WHICH CAN EMIT GREEN FLUORESCENCE.



SCRUNCHED UP

THE FUNCTION OF RIBOSOME IS ASSEMBLING FREE
SUBSTANCE IN CYTOPLASM, WHICH IS ACCORDING
TO CODE SEQUENCE.

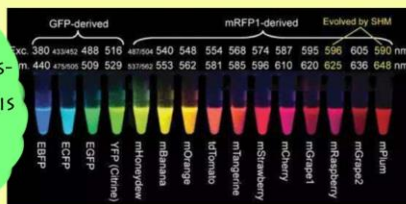


Tip:

FLUORESCENT PROTEIN IS A PROTEIN OF STEADILY EMITTING
FLUORESCENCE. THEREFORE, IT IS USUALLY USED TO A REPORT-
ER PROTEIN. IN OTHER WORDS, WE CAN THROUGH FLUORE-
SCENT STRENGTH GET THIS CIRCUIT'S GENERAL STRENGTH.

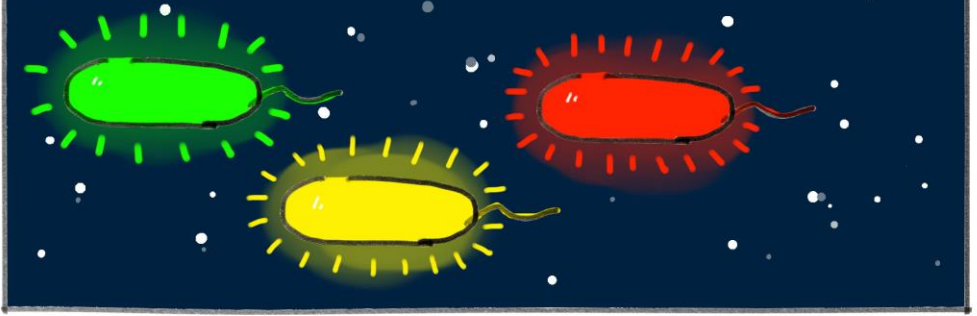


MANY FLUORE-
SCENT PROTEIN IS
FOUND FROM
JELLYFISH.

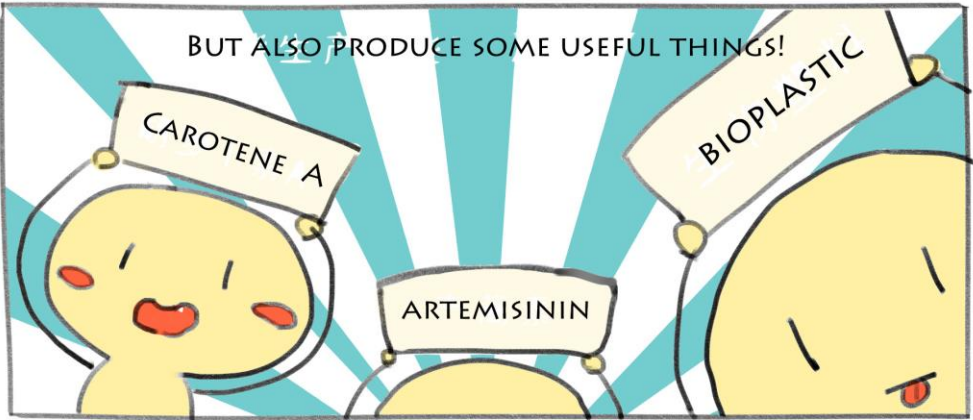


VARIOUS
FLUORESCENT
PROTEIN.

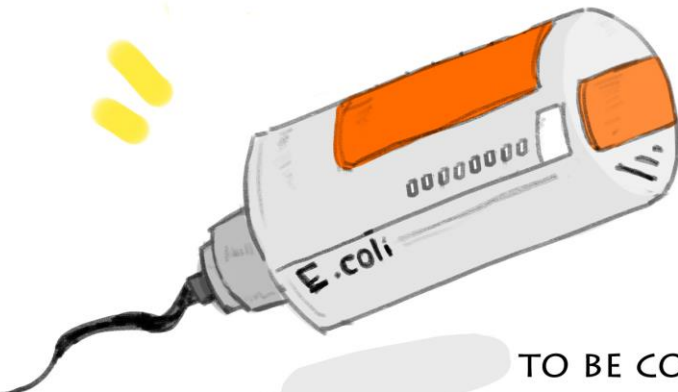
OF COURSE, WE NOT ONLY CAN EMIT GREEN FLUORESCENCE.



BUT ALSO PRODUCE SOME USEFUL THINGS!



CERTAINLY, SYNTHETIC BIOLOGISTS USE E.coli
MUCH MORE THAN THAT!



TO BE CONTINUED....