THE GEEKLY

The perfect magazine for science lovers

GM CROPS: GOOD OR BAD?

CLONING

QUANTUM COMPUTING

WORMHOLES

NANOTECHNOLOGY

GENETIC ENGENEERING

CODE OF LIFE

Akhilesh Balaji

A detailed paper on the structure of DNA, and the role it plays in keeping us alive.


TheGeekly

Editor's Note

Welcome to the first ever issue of our magazine, The Geekly. The Geekly brings into your notice the science in your everyday lives, from your cooking stove to your walls, to the food you eat. You yourself are science! This issue contains debates, articles, puzzles, and even an "of the month" section, for starters. As the issues go on, more and more interactive "widgets" will be added to make the science in your life more and more obvious to you. Until then, keep geeking!

Happy Reading,
Akhilesh Balaji and Dhruv Ramu
Editor and Founders of The Geekly
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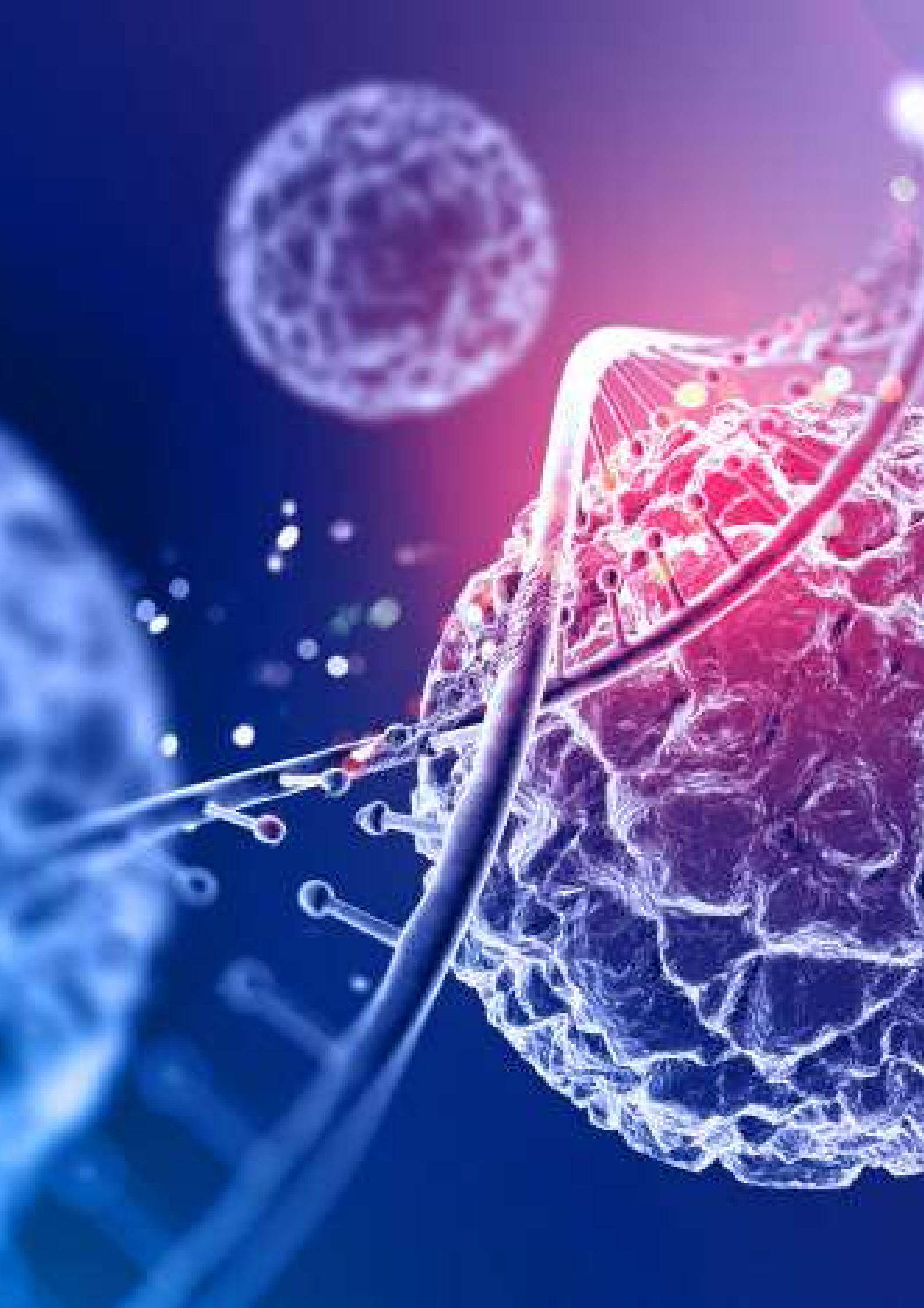
TheGeekly



AKHILESH BALAJI

THE CODE OF LIFE

AKHILESH BALAJI EXPLORES THE MACROMOLECULE OF DNA, OR DEOXYRIBONUCLEIC ACID, AND HOW IT HELPS US LIVE, OR DETERMINE OUR PHYSICAL FEATURES, AND ABILITIES. COULD THE CONTENTS OF THIS GIANT MOLECULE BE ALTERED TO THE PERSON'S NEEDS/WANTS? READ ON AS AKHILESH BALAJI BEAUTIFULLY EXPLAINS THE CODE OF LIFE.

THE CODE OF LIFE

Featured

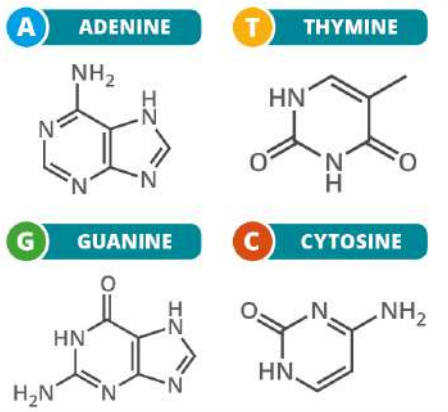
There is one molecule that decides everything about you. Your eye color, hair color, behaviour appearance, all of them are decided by this one (macro)molecule. It is the code of life for all organisms alive. Without it, there would be no you. That macromolecule is deoxyribonucleic acid, or, more popularly, DNA.

60 years ago, James Watson, and Francis Crick cracked the structure of DNA. It turned out to be a double helix, a spiral staircase-like structure. The double helix has a backbone of the sugar deoxyribose bonded to one phosphate group. The "Steps" are actually nucleotides, or the four bases: Adenine (A), Thymine (T), Cytosine (C), Guanine (G), where A bonds with T, and C bonds with G. When put together, these nucleotides form the human genetic code. But how do these molecules decide how we live our life, or help us live, at all?

This is called the process of DNA transcription and translation, put simply, protein synthesis. During the process of protein synthesis, a protein called RNA polymerase unzips the DNA, and transcribes it to RNA. RNA is the same as DNA, except for the fact that it uses the base Uracil (U) instead of Thymine. Uracil still does pair with Adenine. The RNA bases come together to form messenger RNA, or, in short, mRNA. DNA is transcribed onto the mRNA, because it would get corrupted if it travelled outside the nucleus. The mRNA then travels to another organelle known as the ribosome. The ribosome contains two parts, or lobes. The first is the large subunit of the ribosome, and the second segment is the small subunit. This segment has 3 sections in it. The mRNA then coils itself around the ribosome. Then another type of RNA comes into the picture. This is the transfer RNA (tRNA). Each tRNA is shaped like a little key with a molecule known as an amino acid at the end of it. Amino acids are the building blocks of proteins.

But, back to the RNA for now. A set of three base pairs is called a codon, and its matching codon is called its anticodon. The tRNA has an end with a codon on it. Now, when the tRNA comes across a matching codon for the mRNA, the matching tRNA amino acid is added to the chain, to be part of the protein. After the ribosome comes across a "stop" codon (UAG, UAA, and UGA), the amino acid chain, which, by now, looks like a pearl necklace, floats off, and travels to the golgi apparatus. Here, the chain is moulded into a shape that the cell can use. THE PROTEIN IS READY. But, what exactly does a protein do?

A protein helps with the cell's daily activities, such as carrying oxygen, in the case of hemoglobin or myoglobin, or a task as simple as zipping DNA up, and down. Proteins are also used to splice DNA, and bind to specific foreign particles, such as viruses and bacteria, to help protect the body, in the case of antibodies.



Now, when the sperm reaches the egg, several genes randomly combine to determine your traits. These genes are called "alleles", which are further classified as dominant, and not dominant. Let us suppose that there are 2 genes that determine whether a pea is wrinkly (s), or smooth (S). S is the more dominant gene, while s is the recessive gene. In the combination "SS", the pea is smooth. If the combination is "ss", the pea is bound to be wrinkled. These are called homozygous. But, what if there is a combination of alleles like this: (Ss). Would the pea plant be half wrinkled, and half smooth? It isn't that complicated, at all. Since S is the dominant gene, the pea plant will have smooth peas.

Now, let us say that pea plant A has the alleles SS, and pea plant B has the alleles ss. If they both are cross bred the probabilities are as follows:

→1/4: SS
→1/4: ss
→1/4: sS
→1/4: Ss

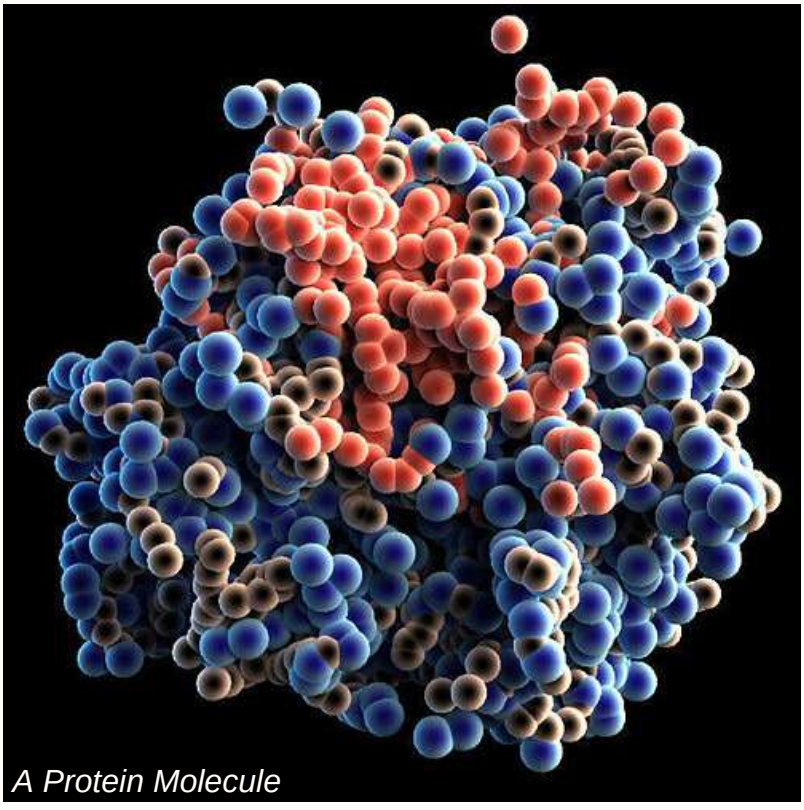
The results can be summarized in the grid below:

	S	s
S	SS	Ss
s	Ss	ss

Now, let us go a step further, and add another allele to the same grid, A and a. They stand for green (recessive), and yellow (dominant) peas. It will look something like this:

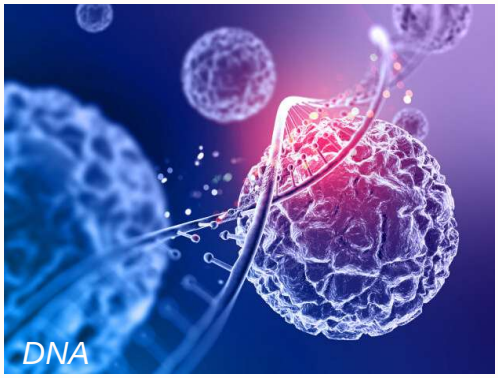
	AS	As	aS	as
AS	AASS	AASs	AaSS	AaSs
As	AAsS	AAss	AasS	Aass
aS	aASS	aASs	aaSS	aaSs
as	aAsS	aAss	aasS	aass

Now, imagine the billion, or more alleles that are there in your body: hair color, earwax, height, etc. Imagine how big the grid would be, if drawn. And imagine the one in a billion chance of you being what you are.

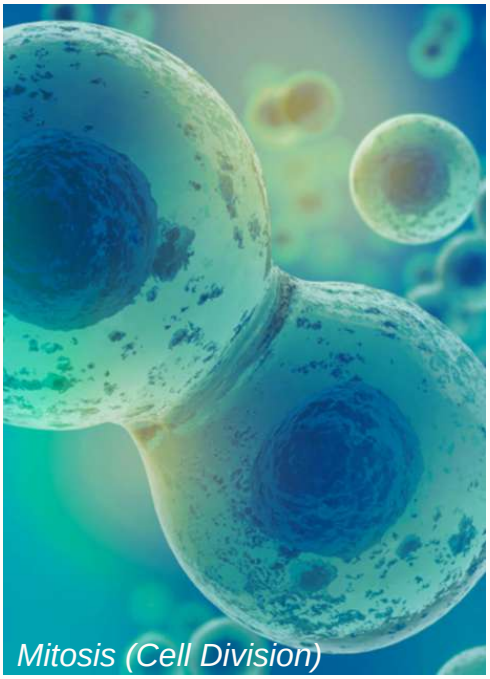


A Protein Molecule

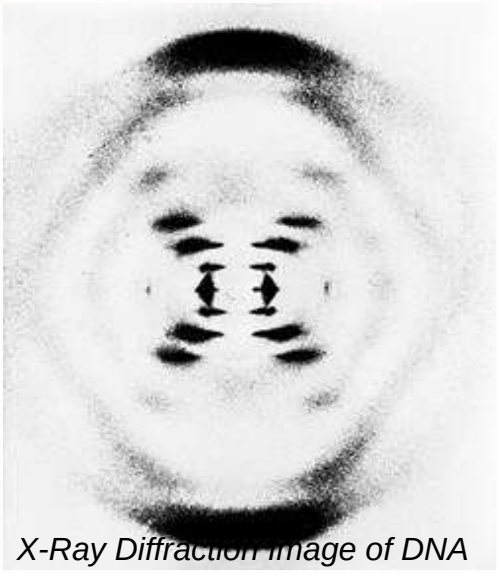
GALLERY



DNA



Mitosis (Cell Division)



X-Ray Diffraction Image of DNA

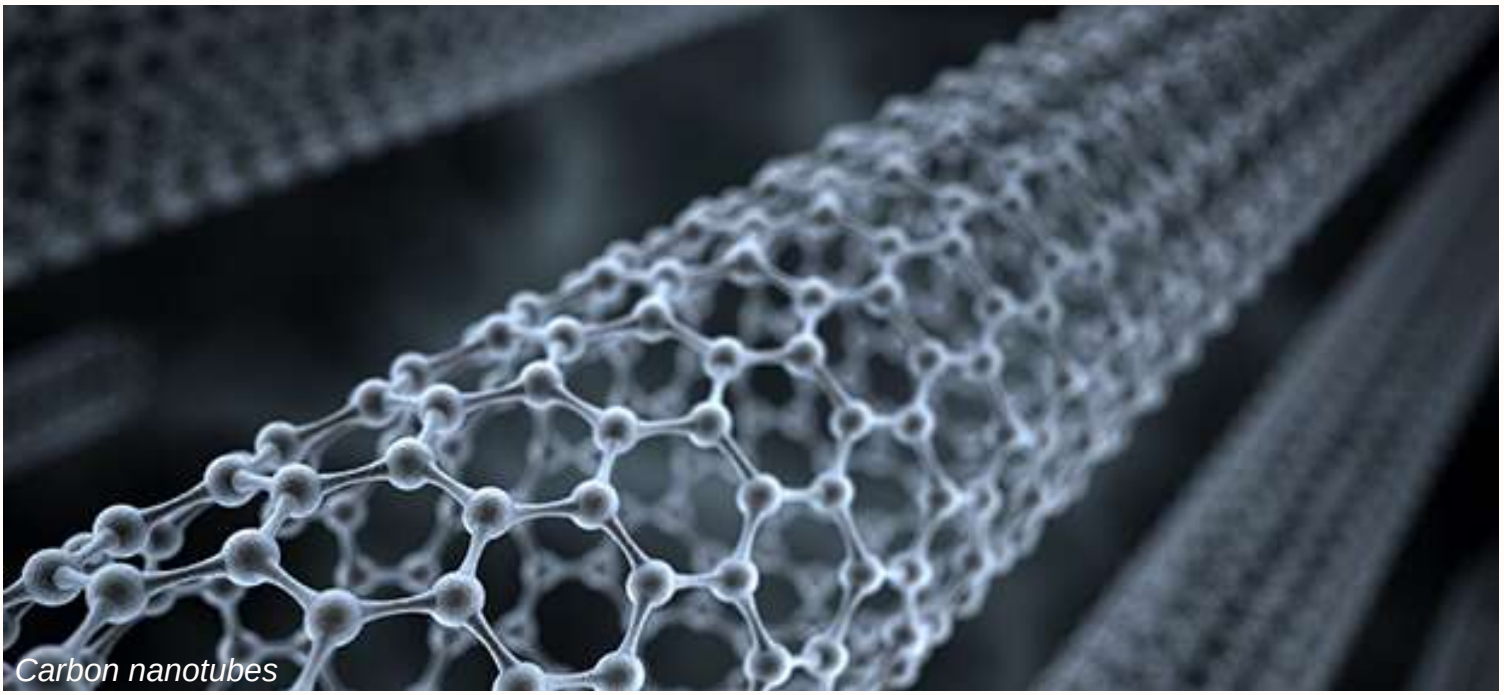
DHRUV SURESH RAMU

THE NANO REVOLUTION

THE WORLD AROUND US IS GOING BEYOND GLASS, PENCIL LEADS, AND STEEL. THERE ARE NOW 1 NM THIN TUBES OF CARBON THAT ARE STRONGER THAN DIAMOND. THERE ARE CARBON RINGS THAT CAN STOP A BULLET. READ ON IN ADMIRATION AS DHRUV RAMU TAKES YOU ON A TOUR AROUND THE NANOTECHNOLOGICAL REVOLUTION...

THE NANO REVOLUTION

Breaking it down:
To understand nanotechnology, we must break down things to a much smaller scale, to things which we cannot see with the naked eye, but exist. You may be thinking of atoms, and you are right. When an empty glass is held, is it almost 'bound' together? If you touch it with your finger, does it fall apart? We know what each object is made of; Atoms, the building blocks of everything. The glass can only be held and not dropped, can be seen through and can hold water, mainly because of the structure of the atom. You can look at this in terms of a machine. Every single individual part, from a washer to the fuselage of it, simply must be required. However, we can use parts from that machine to make something else. This brings us to the idea of restructuring things so they can be used for something else. When we look at atoms, if we change the way they are arranged correctly, they can be something else... not your conventional ones. To understand restructuring atoms, let us look at the 'lead' of the pencil, which is known as graphite. Graphite is made of carbon atoms, like how diamond is also made of carbon atoms structured differently. What is it, and can we work with it?"Nano", means 'submicroscopic', hence the word "nanotechnology".
Nanotechnology involves the ability to control and see individual atoms. To create nanotechnology, you need nano materials. Nano materials are classified when they are smaller than 100 nanometres. A hundred nanometres is a 10,000th of a millimeter, that's how small it is. This is in the nano scale, smaller than ourselves(mesoscale) and even smaller than some of our cells(micro scale). To 'see' nano materials, you need to look at samples magnified about a million times. That means, to 'see' nano materials, you need an electron microscope. However, nano materials are so tiny, you will need a 'scanning tunneling microscope',
This enables you to move them around and see them. The solution to our problems.We, as developing humans achieve incredible feats all the time. The bigger buildings, the bigger 3D printer, we are achieving bigger goals. However, the bigger something is, it does not have to be better. When you want to fix problems on a microscopic scale, you can't always use a machine a 1000 times its size to fix it. You need something much smaller to achieve your goal, and in the case of insulin or foreign cells that actually can benefit us, nanotechnology.
Its Specialty:
As small as nanotechnology is, is can be better than larger technology, with better properties like increased strength, conductivity and chemical reactivity. What scientists find fascinating about nanotechnology is that we can reshape it, change its colour, label it for our ease; this all helps us.Nanotechnology helps us in achieving tasks like this. This means that nanotechnology can heal patients as they react with cells and other microorganisms on a small scale. Nanotechnology also has better surface area, which can aid us in designing better water treatment plants.Products in the market already?Products that use principles of nanotechnology are already in the market!
Here are some examples:
Sunscreen - Believe it or not, there is a type of sunscreen using nano particles! These particles are smaller, so a whitish look does not appear when this is applied.
Self-cleaning glass- A company called Pilkington developed glass which uses nano particles to make the glass photo catalytic and hydrophillic. The photo catalytic effect, by definition is when UV radiation from light hits the glass, nano particles become energized and begin to break down and loosen organic molecules such as carbon on the glass such as dirt. Hydrophilic means that when water makes contact with the glass, it spreads across the glass evenly, therefore the glass is washed cleanly and evenly.



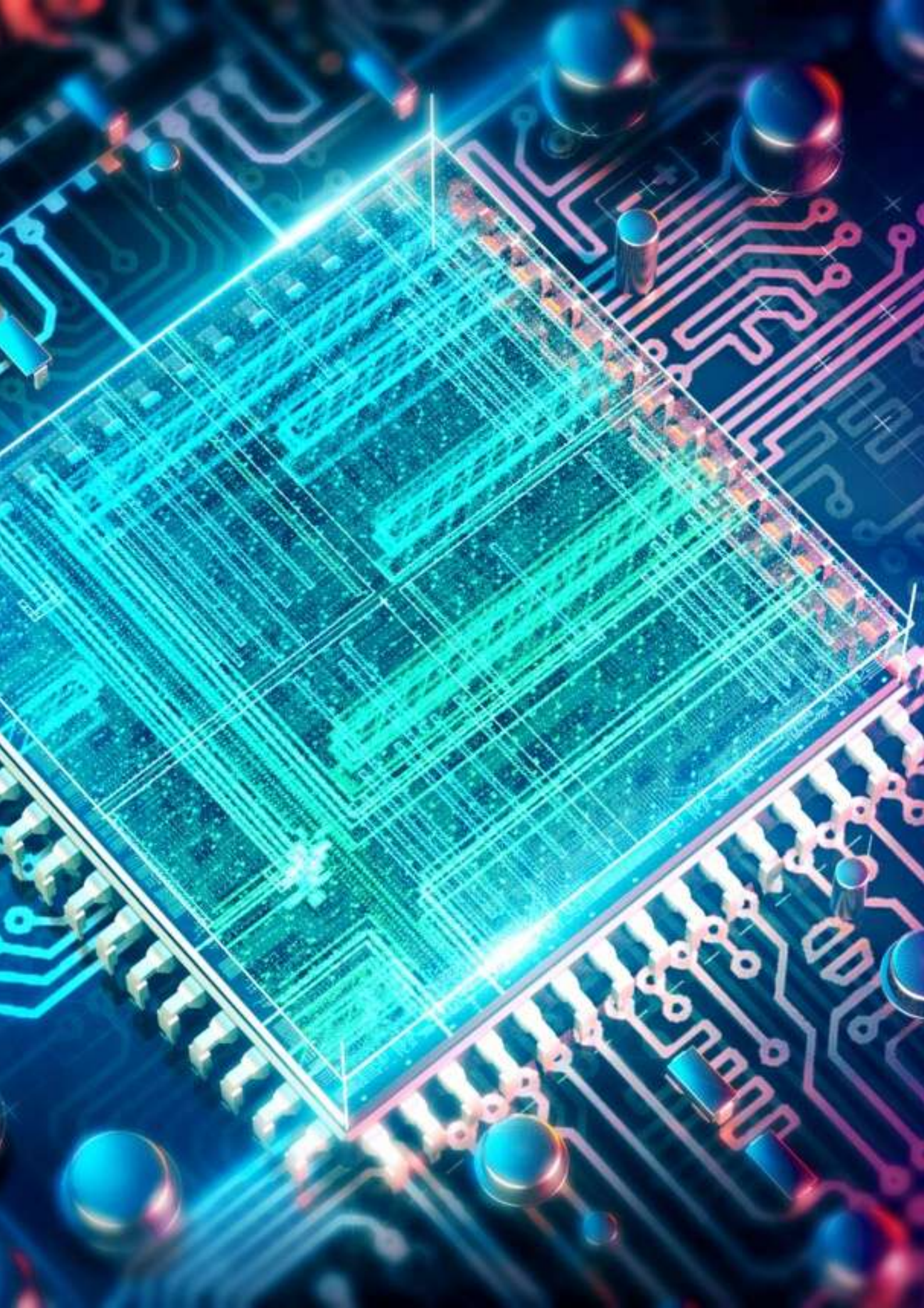
Carbon nanotubes

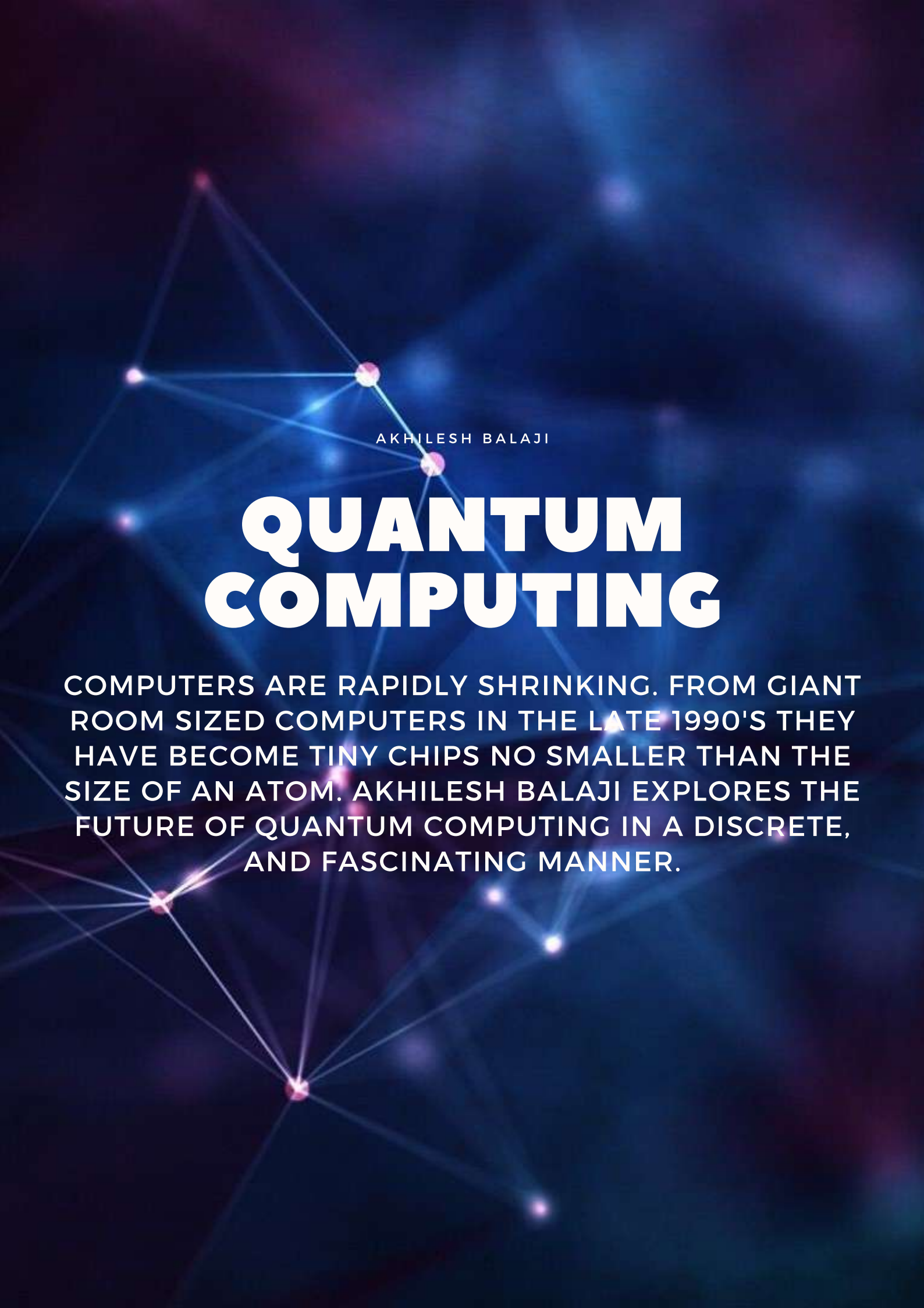
Clothing - Scientists are using nano particles to enhance your clothing too! By coating fabrics with a thin layer of zinc oxide nano particles, producers can sell merchandise that protects you from UV rays. Stain-resistance clothes are also in the market. The nano particles form ‘invisible’ hair that repels water and other particles.
Antimicrobial bandages - These special bandages have nano particles of silver. As silver ions block microbes’ respiration, harmful cells are killed.

Must See:
"Small Wonders:The World of Nano science," Nobel Prize winner Dr. Horst Störmer

GALLERY

Fullerenes





AKHILESH BALAJI

QUANTUM COMPUTING

COMPUTERS ARE RAPIDLY SHRINKING. FROM GIANT ROOM SIZED COMPUTERS IN THE LATE 1990'S THEY HAVE BECOME TINY CHIPS NO SMALLER THAN THE SIZE OF AN ATOM. AKHILESH BALAJI EXPLORES THE FUTURE OF QUANTUM COMPUTING IN A DISCRETE, AND FASCINATING MANNER.

QUANTUM COMPUTING

Computers first started off as gigantic lumps of whirring metal and creaking tubes that were stored only in labs. Then they became fat monitors to which giant metal CPUs had to be attached. Today, they are book sized monitors with a built in keyboard and mouse, and a tiny CPU the size of your pinkie finger. But, science marches on.

Even as you are reading this article right now, scientists are working on atom-sized chips that are soon to become lightning fast computers based entirely on probability. These are quantum computers.

Let us first understand how a normal computer works. The smallest part of a computer today is the transistor. It is a switch that can either block or allow information to pass. Information is stored in the form of "bits", which are either a zero or a one. Combinations of bits can represent more and more complicated information. Transistors make up logic gates. There are 6 kinds of logic gates.

The AND gate gives an output of 1 only if both of its inputs are turned on, otherwise, a 0.

A NOT gate gives an output of 1 if its inputs are turned off, and other wise gives a 0.

An OR gate gives an output of 1 if both of its inputs, or one of its inputs are turned on, else a 0.

A XOR (Exclusive OR) gate gives an output of 1 if either one of its inputs are turned on. If both or none of its inputs are turned on, the output is a 0.

A NAND (Not AND) gate behaves in the opposite fashion to and AND gate. You can think of it as an AND gate followed immediately by a NOT gate. Its output is 0 when the two inputs are 1, and for all other cases, its output is 0.

The last gate, NOR gate, behaves in opposite fashion to the OR gate.

Combinations of logic gates can let you add, and if you can add, you can multiply, and if you can multiply, you can do practically everything that can be done (with a computer, of course).

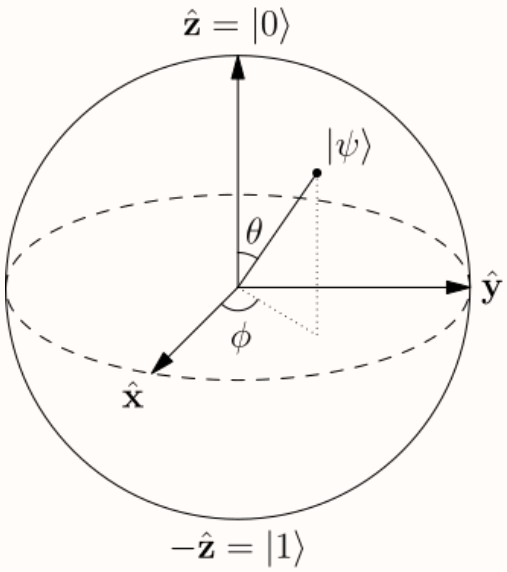
A quantum computer uses something known as a "Qubit", which can also be set to one of two values. It can be any 2 levelled quantum system such as a spin and a magnetic field. A Qubit can be either a 0 or a 1 until it is measured. This is known as a superposition of states. This is an unusual property of quantum particles best described by the thought experiment "Schrödinger's cat", proposed be Physicist Erwin Schrödinger. A living cat is placed into a steel chamber along with a hammer, a vial of hydrocyanic acid and a very small amount of radioactive substance. If even a single atom of the radioactive substance decays during the test period, a relay mechanism will trip the hammer, which will in turn, break the vial of poisonous gas and cause the cat to die. The cat is either alive or dead until you open the chamber, and find out. Due to this property, 20 qubits can store a million values in parallel.

Another really weird property is quantum entanglement. During quantum entanglement, a change in one of 2 "entangled" qubits will instantly cause a change in the other, no matter it's distance. For example, if one qubit is at the other end of the universe, and you find that the second qubit (in your hand) is a 1, then the entangled qubit is instantly changed to a 0.

A quantum computer uses quantum gates instead of logic gates. A quantum gates takes one input, and rotates probabilities to give the output.

Quantum computers could also be used for simulation of the quantum environment. Simulation at the moment is extremely expensive. So, why not simulate the quantum world with quantum?

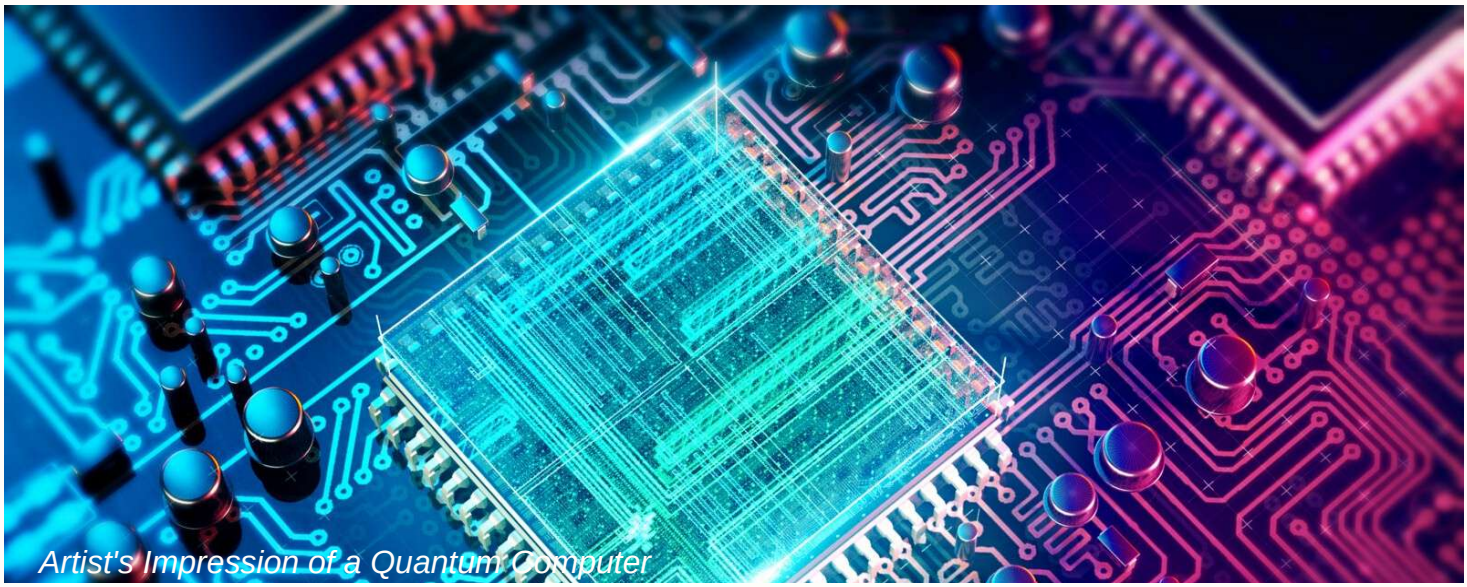
Now, let us look at the qubit in more detail. A qubit is represented by the Bloch Sphere.



In quantum mechanics, the Bloch sphere is a geometrical representation of the pure state space of a two-level quantum mechanical system (qubit), named after the physicist Felix Bloch.

Quantum mechanics is mathematically formulated in Hilbert space or projective Hilbert space. The space of pure states of a quantum system is given by the one-dimensional subspaces of the corresponding Hilbert space (or the "points" of the projective Hilbert space). For a two-dimensional Hilbert space, this is simply the complex projective line $\mathbb{CP}$. This is the Bloch sphere.

The Bloch sphere is a unit 2-sphere, with antipodal points corresponding to a pair of mutually orthogonal state vectors. The north and south poles of the Bloch sphere are typically chosen to correspond to the standard basis vectors and , respectively, which in turn might correspond e.g. to the spin-up and spin-down states of an electron.



Artist's Impression of a Quantum Computer

This choice is arbitrary, however. The points on the surface of the sphere correspond to the pure states of the system, whereas the interior points correspond to the mixed states.

Just like there are gates in today's computers, there are quantum logic gates, as well. These gates can be put together to create superposition and entanglement, and more and more complex algorithms.

Hadamard gate: A Hadamard (H) gate creates superposition by rotating the Bloch sphere first on the X dimension, then on the Y.

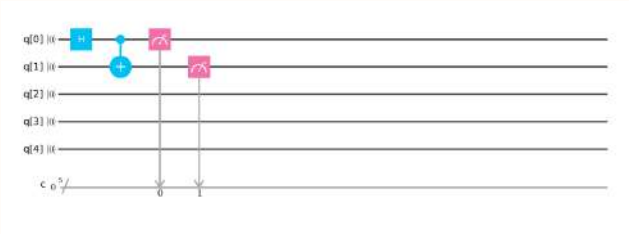
X gate: The quantum X gate rotates the Bloch sphere on the X axis, flipping the spin. If the qubit is in a |0> state, and you apply an X gate, the state changes to a |0> state.

Y gate: A y gate maps |0> to *i*|1> and |1> to -*i*|0>.

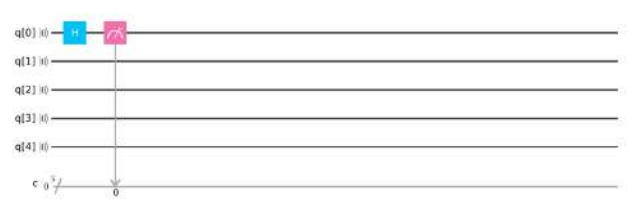
Z gate: A z gate is a tiny bit more complicated. It is also called the phase-shift gate, and leaves |0> unchanged, but maps |1> to -|1>.

C-Knot gate: The C-knoy gate creates entanglement between qubits.

There are many other types of qubits, but the ones listed above are the fundamental ones. If I wanted to create entanglement between Qubits, it would be done this way:



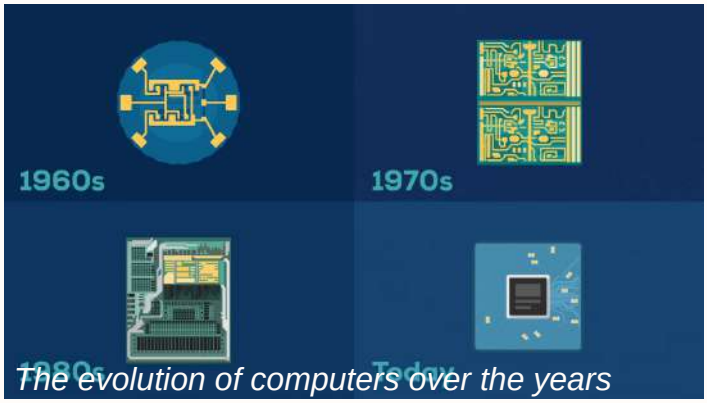
Superposition would be created this way:



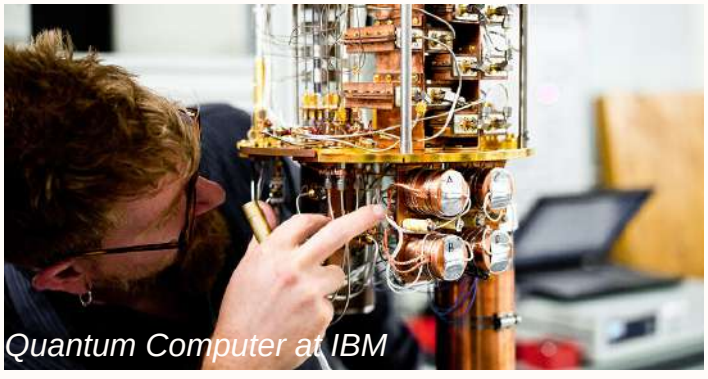
And this is the probability for the Qubit being either a zero or a one:

Quantum computers are in the embryo stage, and are stored only in labs, but did you know that you can use a quantum computer for free, online? IBM has hooked up a 5 bit quantum computer to the web, so you can run algorithms on one! Prepare to be the scientist of the future!

GALLERY



The evolution of computers over the years



Quantum Computer at IBM

Akhilesh Balaji

DHRUV SURESH RAMU

THE INTERGALACTIC PORTALS

MANKIND HAS LONG WANTED TO SOAR THROUGH THE SKIES LIKE THE BIRDS; WE GOT MORE THAN THAT: SPACE TRAVEL. BUT IT TAKES A WHILE TO GET THROUGH MILLIONS OF LIGHT YEARS WITHOUT TRAVELLING AT THE SPEED OF LIGHT. SCIENTISTS SUSPECT THE EXISTENCE OF WORMHOLES: SPACE PORTALS. DR RAMU EXPLORES THE PROBABILITY OF THEIR EXISTENCE, AND THE THEORY BEHIND THEM.

THE INTERGALACTIC PORTALS

Wormholes, a famous word known as the possible intergalactic shortcut. An intergalactic tunnel through space-time that allows travellers to move through time and space with just a hop, faster than the speed of light.

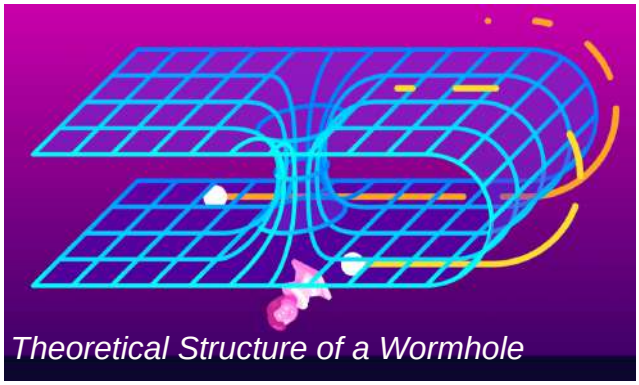
Wormholes were first thought of in the year 1916. Austrian physicist Ludwig Flamm studied solutions to the equations of Albert Einstein and found an opposite of a black hole — “white hole”, a time-reversal of a black hole. These entrances to both holes could be connected through a special space-time channel. However, no known process in the universe could form a white hole, and instability would probably destroy itself. The mechanism/process for creating black holes, the collapse of high-mass stars prevents the formation of a white hole that is symbiotic to it.Einstein and Nathan Rosen wore both physicists who proposed the existence of “bridges” through space-time. The purpose of these bridges was to connect two specific points in space-time, creating a travelling alternative. That is how the name Einstein-Rosen Bridges, aka Wormholes, was created.The structure, theoretically→ Wormholes contain two mouths, with a throat-like structure connecting the two. The mouths would most likely be spheroidal. The throat might be a straight route, but it could also have turns, taking a longer route than a more conventional route might require. However, as we have not found a wormhole or any remnants of it yet, we cannot prove which shape it has on the inside.The theory of Relativity may mathematically prove that wormholes exist, however, we have not come across one.There are equations in Einstein’s theory of general relativity that can allow the existence of wormholes where each mouth of it is a black hole. However, after a massive star dies a wormhole is not created on its own.

→ One of the biggest problems is the size. Primordial wormholes are predicted to exist with the size 10-33 centimeters. However, with an expanding universe such as the one which we reside in currently, the size of wormholes may increase simultaneously.

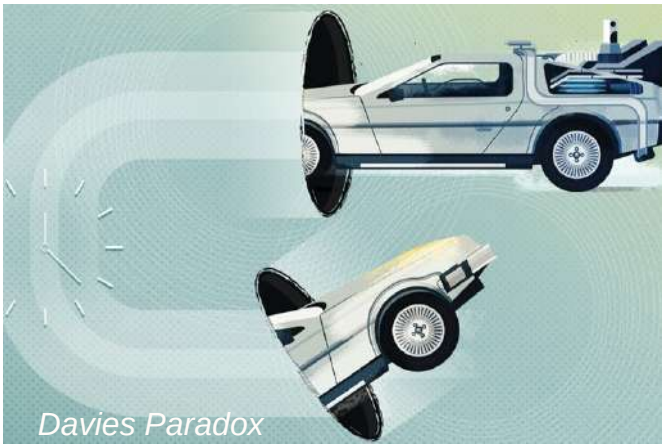
→ Another problem comes from stability. The predicted Einstein-Rosen wormholes would not be as effective as these wormholes could collapse as soon as a particle enters it due to gravitational forces. Exotic matter is a type of matter that is predicted to not be affected by gravity and has unique properties. Scientists believe that this could be used to stabilize wormholes. Unfortunately, we have not come across exotic matter and it is deemed to be dangerous. The problem with using wormholes as a method of travelling is that they are potentially unstable and dangerous. Fluctuations within it could be caused if matter enters it. These fluctuations can even lead to its collapse. There are theories that using negative energy, the wormhole could be held open, with all of the energy’s properties contrary to that of the substance. However, a lot of negative energy is required for it to be employed, but it may be able to let objects larger than 15 cm pass through it. Most scientists find this an extremely hard possible task because they lack real understanding about it. Even if a wormhole did form and we had enough negative energy before it can be released the wormhole tunnel would immediately snap extremely quickly.One paradox that has confused and puzzled physicists for years is the Davies paradox. In the Davies paradox, there is a wormhole with the two entrances at the same area. If a billiard ball is thrown in at the correct speed, angle and time, the ball will be just in time to knock the billiard ball that was going to go in the wormhole off, causing the ball wouldn’t have gone into the wormhole in the first place, contrary to the fact that it did.

The tools of science are resolute but fair judges; if an idea doesn't work, it simply doesn't work. There are many varied and interesting mysteries in our beautiful universe, and we certainly haven't unlocked all of the inner workings of the cosmos.

GALLERY



Theoretical Structure of a Wormhole



Davies Paradox

Artist's Impression of a wormhole

AKHILESH BALAJI

ONE GENE TO RULE THEM ALL

IF YOU HAD LIVED BACK IN THE 1980'S, YOU WOULD HAVE BEEN TOLD THAT EVERYONE WOULD BE CONNECTED BY A VIRTUAL NETWORK, AND THE POWER OF A SUPERCOMPUTER WOULD HAVE BEEN IN A HANDHELD DEVICE. YOU PROBABLY WOULDN'T HAVE BELIEVED WHOEVER TOLD YOU THAT. BUT, IT HAPPENED, AND WE ACCEPTED THE CHANGE WITHOUT REALIZING IT. IT'S THE SAME WITH GENETIC ENGINEERING NOW.

ONE GENE TO RULE THEM ALL

Humans have been selectively breeding animals and fruits for thousands of years. Using this, we strengthened useful traits in plants and animals. For example, wild bananas have a thick skin, and big seeds, while cultivated bananas are sweeter, and easy to peel.

We selected the organisms with the traits we wanted, and hoped for good results. Sometimes this worked out, sometimes it didn't. When humans began selectively breeding rams, they were reduced to something wooly, docile, and ... ***sheepish!***

This was never really understood until we discovered the code of life: DeoxyriboNucleic Acid. In the 1960s, scientists began carrying out experiments where living organisms were bombarded with X-rays, that created random mutations in the DNA of those organisms. They hoped that, by chance, the mutation would result in a helpful organism. Sometimes, it did, and sometimes it didn't.

But genetic engineering at this time was very expensive, and took a lot of time and work. All of this changed with the discovery of a new technology called CRISPR (**C**lustered **R**egularly **I**nterspaced **S**hort **P**alindromic **R**epeat)

Viruses and bacteria have been fighting since the dawn of life. When a virus, or phage attacks a cell, the cell dies. But, if, at all it survives, it stores a copy of the virus DNA in an DNA archive called CRISPR. When the virus attacks again, the bacterium makes and RNA copy of the virus DNA, and gives it as an input to a protein called CAS9. CAS9 scans every bacterium inside for the same DNA, and when it finds a match, cuts out the virus DNA. The CRISPR system is programmable. Give it a snippet of DNA that you want to modify, and it will do so.

When CRISPR was discovered, scientists injected it into rats with petty much all off their cells infected by the HIV virus. Guess what? Over 50% of the cells were cured!

CRISPR could also defeat cancer by editing our WBC's, making our immune system stronger.

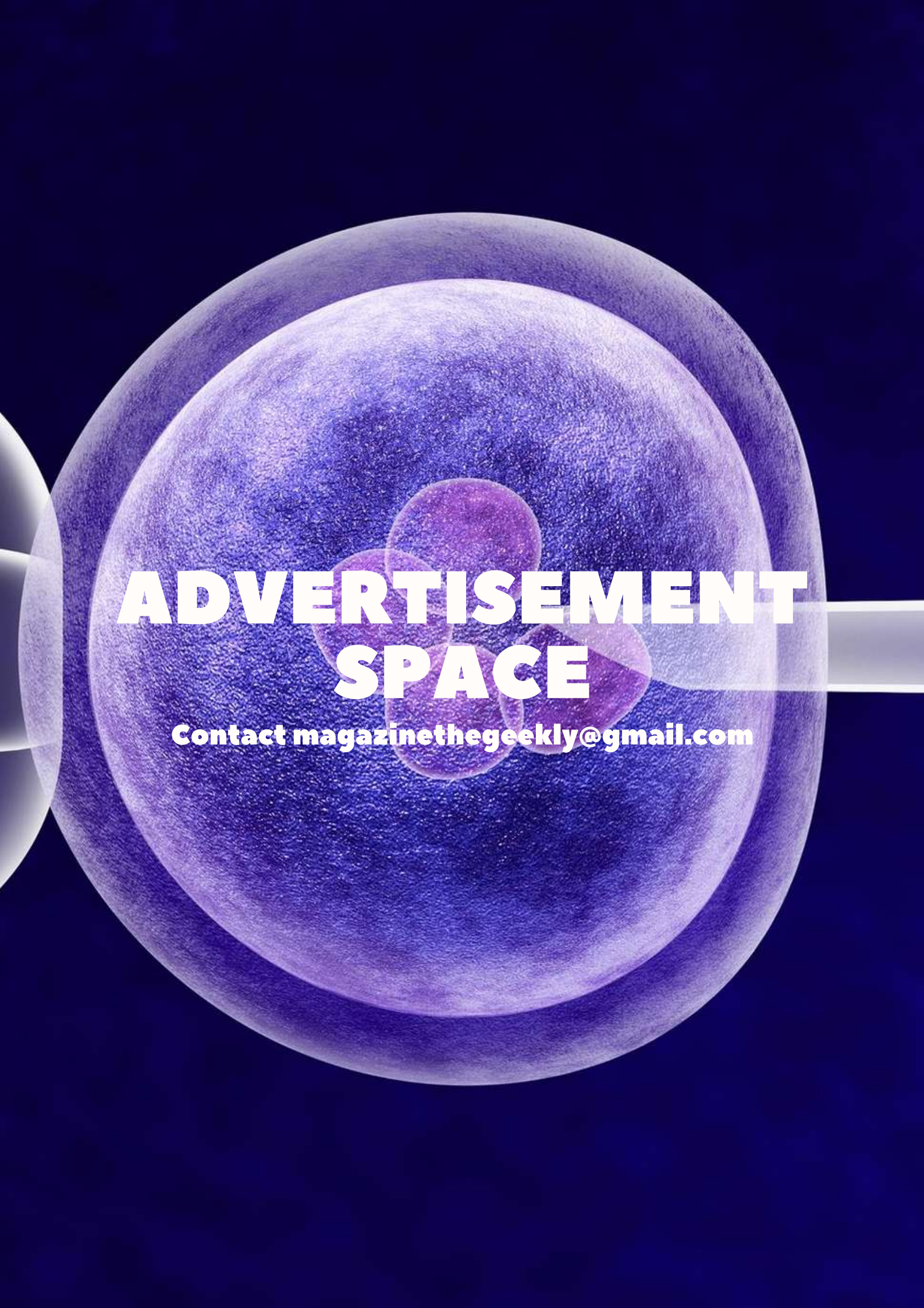
CRISPR can also be used to treat another big issue, genetic mutations. Genetic Mutations are mistakes in DNA that can have a good, or bad effect on the organism. A modified version of CAS9 could easily solve this problem.

There is another big possibility: creating designer babies. Babies can be customized to the parents needs/wants. The first ones will probably be treated to stand against retroviruses like HIV, or diseases. Then, we can be more open to the parent's needs or wants. Why not give the baby fuzzy hair? Or how about a monkey's tail? Go ahead and give it super intelligence! Once the first designer baby is created, and door is opened that cannot be closed. We will have began the genetic revolution.
You can find more about whether GMOs are a blessing or a curse in another article in this magazine.

GALLERY


How you probably think GE works 😆


Genetic Engineering a Tomato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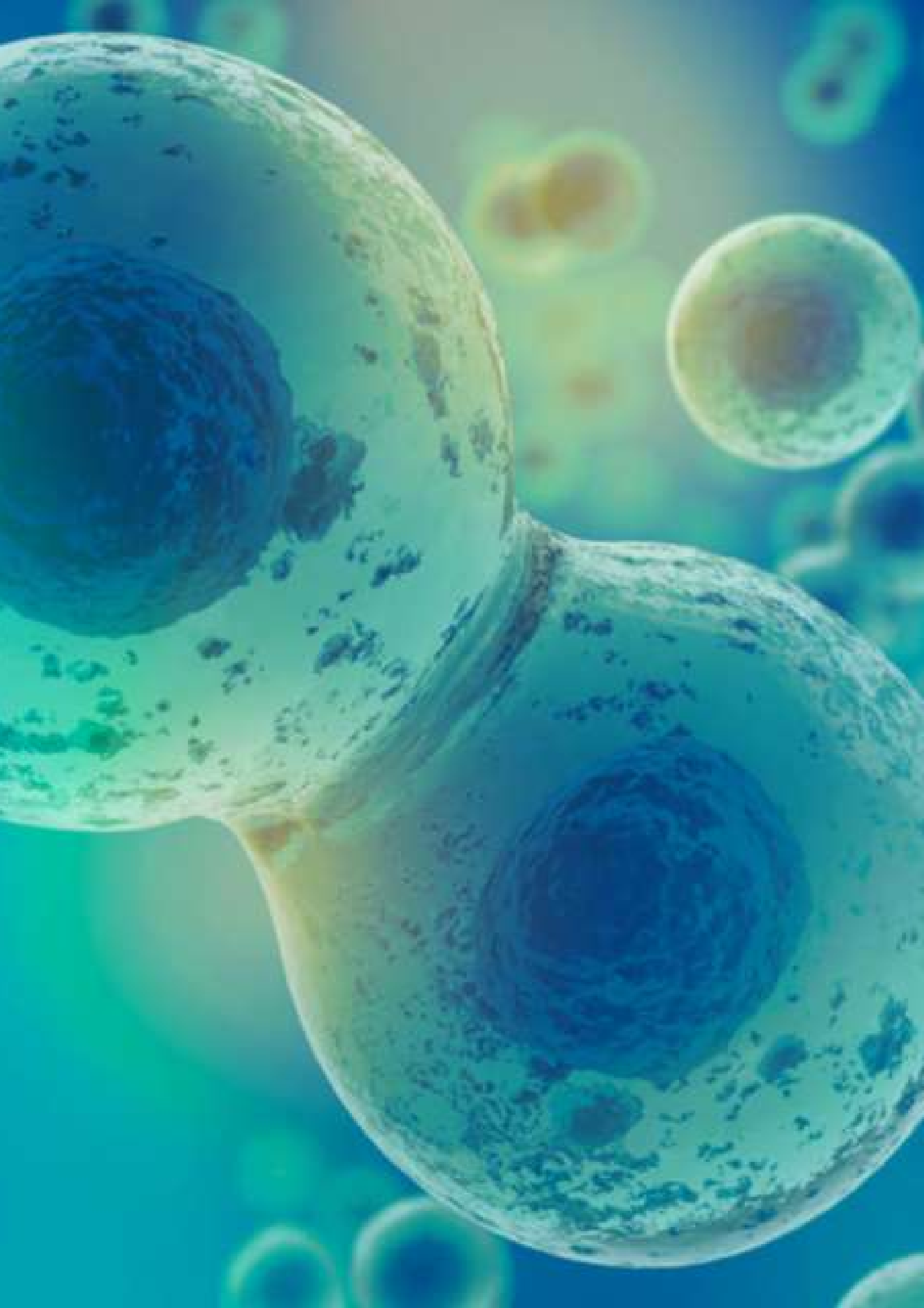
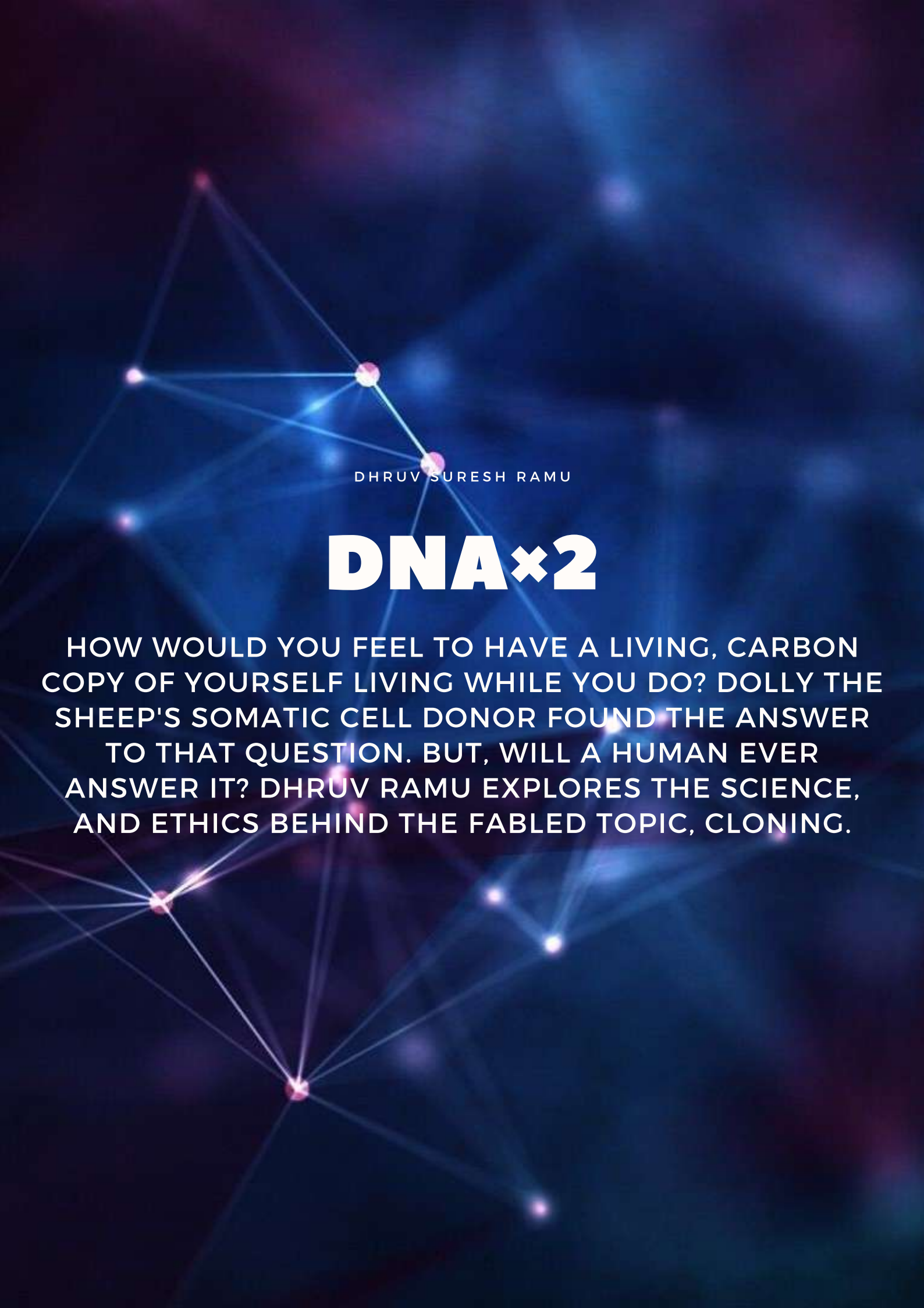




DHRUV SURESH RAMU

DNA×2

HOW WOULD YOU FEEL TO HAVE A LIVING, CARBON COPY OF YOURSELF LIVING WHILE YOU DO? DOLLY THE SHEEP'S SOMATIC CELL DONOR FOUND THE ANSWER TO THAT QUESTION. BUT, WILL A HUMAN EVER ANSWER IT? DHRUV RAMU EXPLORES THE SCIENCE, AND ETHICS BEHIND THE FABLED TOPIC, CLONING.

DNA×2

The world ‘Cloning’, invokes various, maybe unsettling thoughts in your mind. However, is this process possible? Can this change humanity forever? Only technology and time will tell.

What is cloning? In a few words, it is the process of generating a genetically identical copy of an organism or individual gene, or cell for that matter. Prokaryotes, like bacteria ‘clone’ using a process called binary fission. Eukaryotic organisms like humans’ cells divide through a process called mitosis. There are identical copies. Cloning has created controversy over the years. Read on, and choose your side of the debate.

There are three different types of artificial cloning: gene cloning, reproductive cloning and therapeutic cloning.
Type 1: Gene cloning→ Gene cloning is basically when copies of genes are produced.
Type 2: Reproductive cloning→Reproductive cloning is on a larger scale. Whole organisms are cloned.
Type 3: Therapeutic cloning→This type of cloning is used to cure diseases in/and tissue/organs. The necessary parts are reproduced to heal.
These types of cloning are different in many ways, but reproductive and therapeutic cloning share similar techniques.

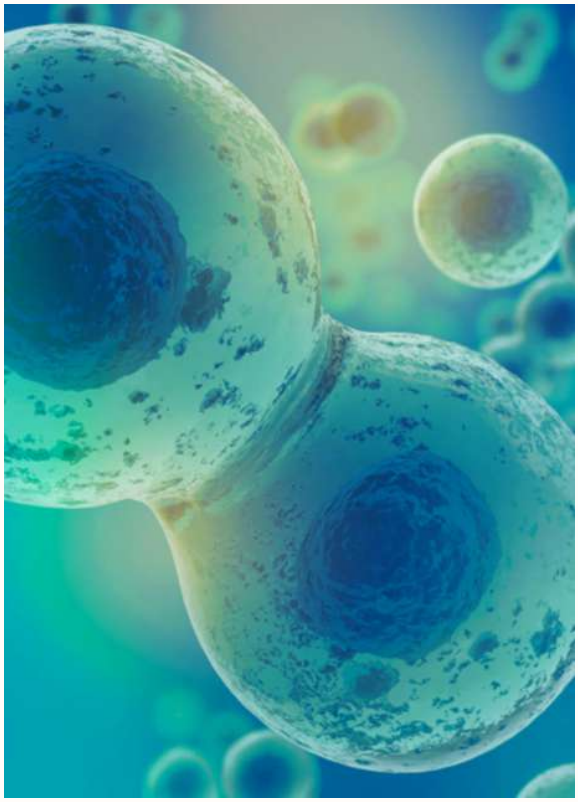
Advantages:
1. People can be saved...
What if someone needs an organ transplant desperately, but cannot seem to find the right match? Instead of hoping to find the right match, the organ, tissue and cells can be cloned to cure the person!
2. It removes the barrier of infertility.
It is a process that allows anyone to have a child that is biologically their own. For those whose bodies cannot support fertility, the cloned cells can be inserted in the embryo, creating new life. This technology would give everyone the chance to become a parent.
3. Humans can live longer.
Throughout the world, the average lifespan ranges from seventy to eighty-five years of age. However, in some countries such as Sierra Leone, it is much, much shorter. Cloning can extend new life capabilities which can even increase human development, progress and productivity.
4. It could restore balance to families.
One of the greatest tragedies that occur in life is the death of a child. Children are killed every year, for various reasons. Sometimes this happens because of disease or illness. There are also accidents and unpredictable events that any child may, unfortunately, face. Cloning gives parents an opportunity to ‘balance’ their grief by creating a new child that will be different, but also similar.

Disadvantages:
1. The biggest argument standing against the process of cloning is genetic malfunction because we may make even the slightest mistake in reproductive cloning, and then that will spread(Son, Daughter to Son to Daughter), which can lead to more deformities, and worst of all, we may be inbreeding with ourselves.
2. This can also ‘break up’ societies, almost creating ‘castes’ within themselves. The reason for this is because those who can afford to clone will be proven ‘richer’, and those who cannot be shunned from society. Simply put, the indirect impacts of cloning can make society prone to separation in communities.
3. It is an unpredictable and certain process.
Cloning is far from a perfected science. In this process, there is a lot to discover, and there are always questions of uncertainty. When Dolly was successfully cloned, only 9 eggs out of 300 were successfully implanted with adult somatic cells to create a pregnancy. Out of those 9 eggs, only one was successfully delivered to term. Despite scientific and technological advances in cloning in about 20 years, this part of science and genetics still has room for exploration.
4. In the process of cloning, human genes are ‘manipulated’, which means that there may be unforeseen consequences not for the greater good of humanity. One of the biggest arguments is this because it opens room for uncertainty, and sometimes, clones may face problems much later in their life-- this can include cancer and other genetic or cellular malfunctioning diseases.
5. Clones may not be considered to be actual humans and could be abused, not given equal rights. In the case of cloning, this is immense because they may be generated for the sole purpose of organ donation or domestic ‘help’. Cloning does not eradicate abuse or neglect-- this applies to child clones.
The advantages and disadvantages of cloning show us that if this science can be managed ethically, there are still societal implications that must be taken into account.
There are potential health benefits, but there are also potential health risks.

The Process:
Gene Cloning: This procedure means that genes are copied. This process is widely used. The procedure consists of implanting a gene from one organism, often referred to as "foreign DNA," into the genetic material of a carrier called a vector. Examples of vectors include bacteria or viruses which are small DNA circles carried by bacteria. When the gene is inserted, the particular laboratory conditions make sure that it multiplies many times over.

Animal Cloning:In reproductive cloning, researchers remove a mature somatic cell, such as a skin cell, from an animal that they wish to copy. Then the DNA of the donor animal's somatic cell is transferred into an egg cell that has had its own DNA-containing nucleus removed.
There are two methods which researchers can use.
In both processes, the egg is allowed to develop into an early-stage embryo in the test-tube and then is implanted into the womb of an adult female animal.
Ultimately, the adult female gives birth to an animal that has the same genetic makeup as the animal that donated the somatic cell. This young animal is referred to as a clone.

GALLERY



Dhruv Suresh Ramu

DEBATE

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BLESSING O


10
R CURSE?

DEBATE GMOs are Bad

GMOs is an abbreviation that stands for “genetically modified organisms.” Sometimes GMOs are referred to as transgenic products. That is because of the genetic transfer which occurs during modern GMO research. The process may also be referred to as genetic modification or genetic engineering, but essentially, it is crop modification. That is, genes from crops are forced into the structures of other crops to supposedly ‘fix’ them, with properties that are newly introduced, such as pesticide killers within the crops which are supposed to help with farming and agriculture as a whole before we image the world of GMOs, where everything is helping humanity, we must look at its disadvantages, and in the present day-why, it must not be encouraged.Although some countries such as the US use GMOs, almost the rest of the world thinks of it without hesitation. “Why?” , you may wonder. Read on to learn about the disadvantages of genetically modified crops, and if we can find a solution so there are many positives.Here are the key disadvantages of GMOs to think about.

1. Everything will end up being genetically modified

Firstly, think about this: You are against GMOs, but 75% of your country is. Which means that if you are in that country, whatever you eat, staple foods included, have traces of genetic engineering. Let me give you an example so you can understand what really happens. You walk to the store and buy honey for your tea. Then, where does honey come from? Bees, that’s right. The bees pollinate. Pollination from?- That’s also right all fields. The bees do not know if it is a GMO or not. Then, the bee makes a hive from which we harness honey. Which means that if you think of buying non-genetically-modified crops, then you will end up with it anyway.

2. There may be an increased risk of allergies or food intolerance.

We know that GMOs have artificial properties that sustain longer with chemical pesticides. You might think that you are getting a “fresh vegetable with juicy flavour and natural colour”. That’s where you are wrong in GMOs. Pesticides have chemicals that can harm you and give you allergies, food intolerance and even diseases. Technically, your food is toxic. Now, when you look at a GMO field and admire the almost zero pest infestation levels, think again.

3. GMOs can contaminate other fields.

The crops may be genetically modified, but they still grow the same way as any other crop. Most crops require pollination to produce the “fruit” that is being grown. Bees pollinate, and we really cannot tell them to not cross-pollinate. Seeds may also be produced by GM crops, and many plants spread them to grow more. If this happens, then other, non-GMO fields might be contaminated. There is no predictable consequence in this situation.

4. Animal proteins could be affected by GMOs.

We know that U.S.A eats GMOs, and they rely on animals as a source of protein, that kind of meal dominating their diet. Genetically modified crops are not only provided to citizens. What about livestock and aquaculture? These factors must be taken into account. Let’s orchestrate a real-life situation. The animal is fed the crops, which may have protein boosters to make the animal grow big, fast and strong. Then, the animal is slaughtered, the germs are chemically removed, and then sold, cooked and eaten. In a nutshell, you are eating genetically modified food, probably with many chemicals.

6. It encourages the use of additional herbicides.

When GMOs are introduced, they were supposed to be eco-friendly and reduce the use of chemical herbicides and pesticides. Unfortunately, more than 80% of GMOs grown around the world are created to be tolerant to herbicides and pesticides.

DEBATE

This means that it is actually increasing the use of toxic herbicides. It has increased approximately by 1500% ever since genetically modified crops were introduced. One of those most common herbicides being used, glyphosate, has been classified by the World Health Organization since 2015 as being a probable carcinogenic. You may wonder why this happens. Read on-

7. GMOs create superweeds.

Herbicide use has increased over the past fifteen years and we know it. Nature, like us, keeps learning. Like how we evolved to become better and smarter, other organisms develop too. As crops have grown more resistant to weeds, the weeds have grown stronger and more resilient to the chemicals applied to them that try to kill them. This is why farmers are almost encouraged, or inclined to use toxic herbicides to kill weeds.

GMOs are Good ✌

PETER DEFAZIO

"Monarch butterflies are becoming extinct" because of increased use of crops genetically modified to withstand pesticides.

— *PolitiFact National* on Tuesday, February 17th, 2015

During an interview with Peter Defazio on Tuesday, Feb 17, 2015, he proclaimed that the endangered and most iconic butterfly species of america, the Monarch Butterfly (*Danaus plexippus*) was "Going extinct due to the extensive use of crops being genetically modified to withstand pesticides".

You may find the urge to believe hime, judging by his position: Oregon's U.S. representative in the 4th Congressional District. But, he was wrong. Defazio made his claim without any proof, so his proclamation was proved "wrong" by scientists. As it turns out, Pollen from Crops engineered to need fertilizers are deadly for Monarch butterflies, but the butterflies have seemed to have realized that, and avoid them. So even though the GMCs are deadly, they are harmless, because monarch butterflies don't approach them.

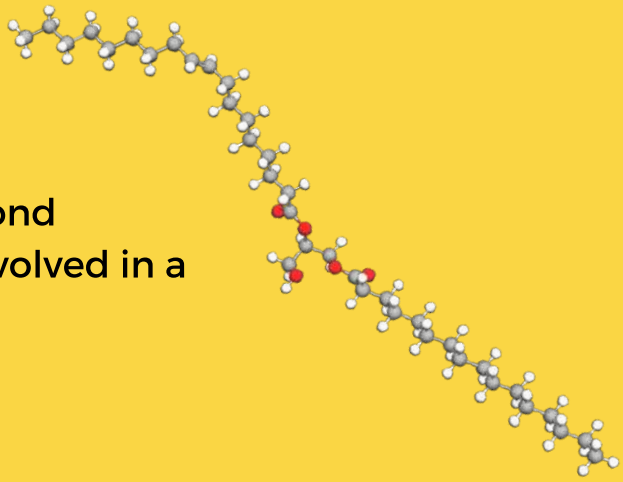
Another advantage is that crops can be genetically modified to prevent bugs from eating/contaminating them. This can be done by borrowing a gene from a bacterium called *Bacillus thuringiensis* is poisonous to insects, but harmless to humans. Such technologies could stop the production of fertilizers, and stop air pollution.

Studies show that eating GMOs is no different from eating non-GMOs.

If you're against GMOs, it's time to change your perspective now.

OF THE MONTH

Protein



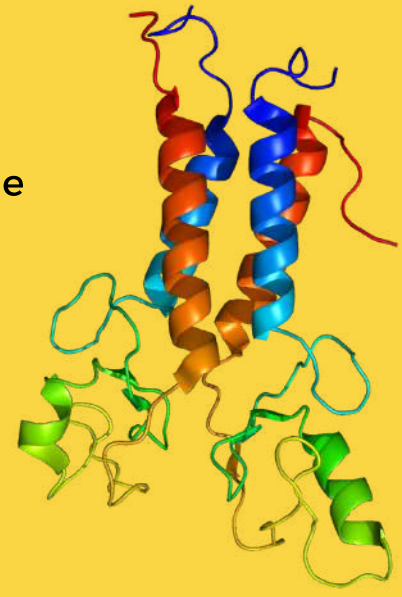
Diacylglycerol (DAG) is a prolific second messenger that activates proteins involved in a variety of signalling cascades.

Scientist

James Dewey Watson is an American molecular biologist, geneticist and zoologist, best known as one of the co-discoverers of the structure of DNA in 1953 with Francis Crick.

Gene

BRCA1 is a gene that normally acts to restrain the growth of cells in the breast but which, when mutated, predisposes to breast cancer. The gene's full name is breast cancer 1, early onset.

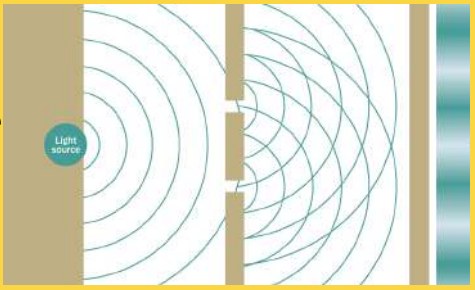


Element

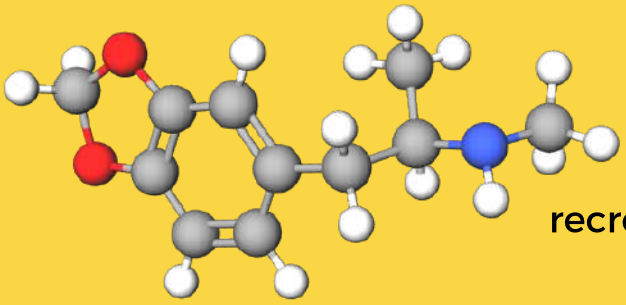
Francium is the second rarest element in the Earth's crust next to astatine. It is a heavy, unstable, radioactive metal with a maximum life of only 22 minutes, then decays and becomes astatine, radon, or radium.

Experiment

Wave-particle duality: Einstein tried to prove that light can also travel as a particle through the photoelectric effect-- he won the Nobel prize for physics because of this experiment.



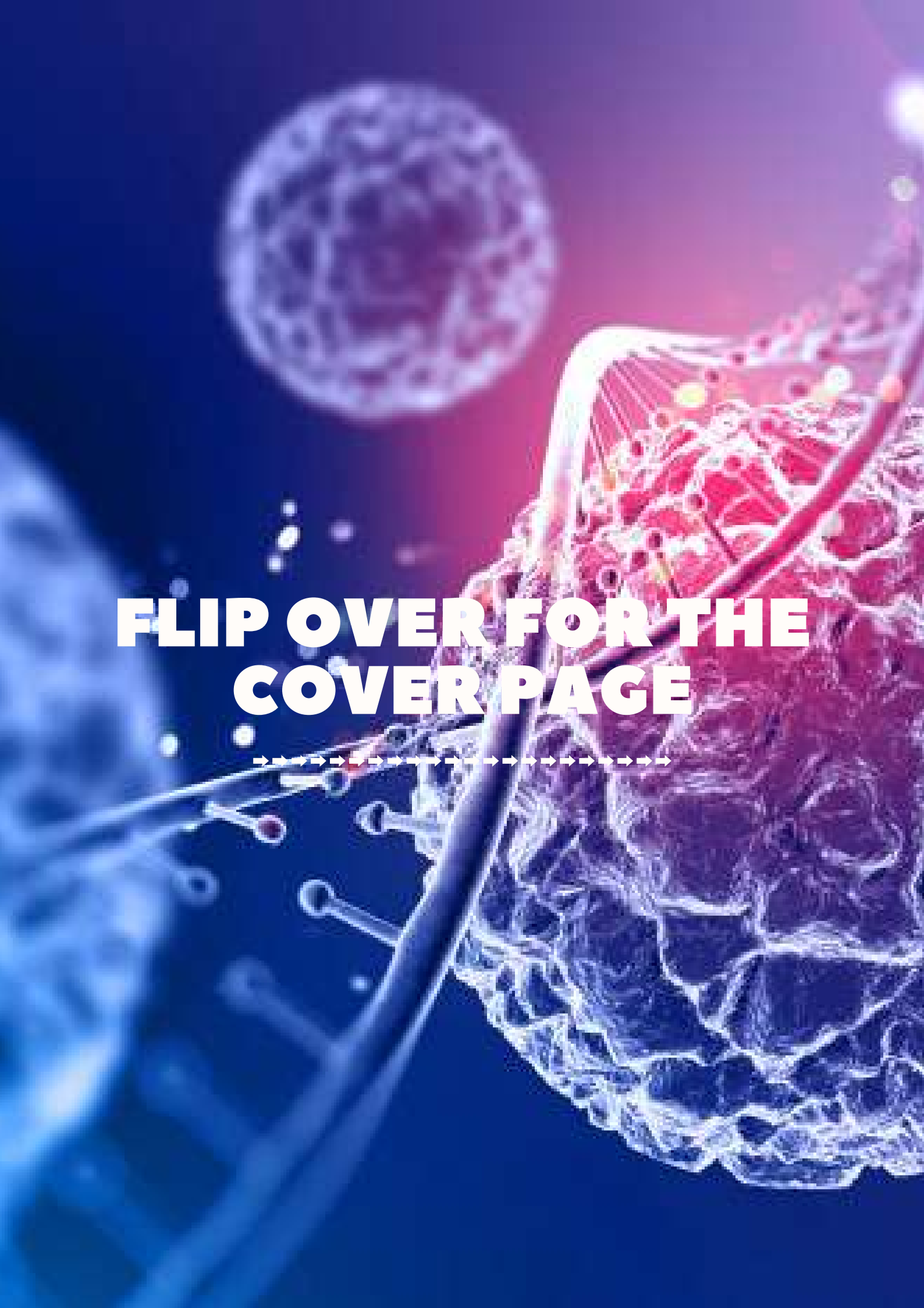
Molecule



Methylenedioxymethamphetamine is a psychoactive drug primarily used as a recreational drug. The desired effects include altered sensations and increased energy, empathy, and pleasure.

Credits

- space.com
- genome.gov
- Cartoon Guide to Genetics, Larry Gonick
- molview.org
- vittana.org
- PolFact National
- canva.com
- IBM Quantum Experience
- Nano.gov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