ATAVISM

A STUDENT-RUN SYNAPSE NEWSLETTER

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ABOUT US

With an aim to nurture skills of all students, the Department of Biotechnology and Bioinformatics, JUIT, has created a platform called Synapse, for students to develop and exhibit their technical, outreach, arts and other skills. And the newsletter is a tiny idea of the members of Synapse Club.

Atavism is a phenotypic trait that appears suddenly in an organism. Yes, it is that feature we have always had the genes for, but have never expressed. Have you heard of the dolphin with legs or the baby born with a tail? Because if you have, you know what we're talking about!

Just like its name, this newsletter is a little something that we always had the genes for, but we never expressed. We agree that the newsletter isn't as weird as the chicken with teeth but it sure is something out of the blue to bring all of us at Department of BT & BI together. We aim to make this newsletter the place you can go for the latest news in the biotechnology world, bizarre but true science headlines, and conversations that you should hear more of.

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We want to hear from you!
If you have any feedback for the team or you want your opinion on biology or your coverage of the latest biotechnology research to be featured in our next issue, please send it to 181824@juitsolan.in. You can write to us even if you want to draw a cartoon for us!

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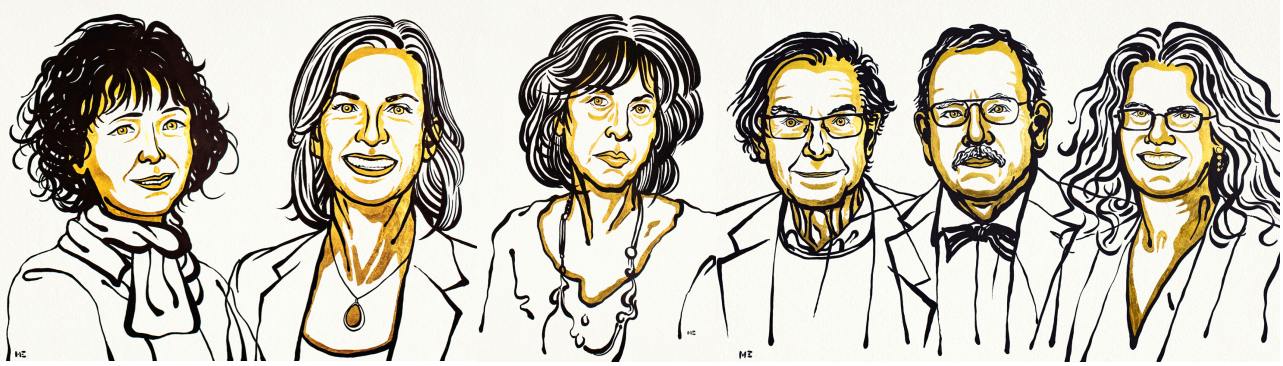
NOBEL PRIZE

A look at the Nobel Prize winners of 2020!



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The beginning of October is a time most of us look forward to as it is the time when the winners of the Nobel Prize are announced every year. And this year has been no different, with most of us being tuned in to know about the works and research that led scientists, doctors, researchers and economists to achieve one of the greatest honors there is. And since Nobel Prize honors extraordinary contributions every year, we couldn't stop ourselves from writing about Nobel Laureates of 2020.

Roger Penrose was awarded the Nobel Prize for Physics this year due to his work on relating black holes to the theory of relativity. The prize also recognizes the effort for a scientific paper he wrote way back in 1965. His work is a great example of "ideas can come to you anywhere" because he has admitted that he thought of this research idea while he was on a crossroad. He is also very fascinated about Black Holes because they form the basis of the second law of Thermodynamics. After all, the greatest entropy in the Universe is in Black Holes.

Reinhard Genzel, another Nobel Physics Laureate of 2020, has been awarded this year for his experimental work to discover the supermassive compact object that is situated at the centre of our galaxy. Interestingly enough, he says that even though the theory of relativity forms the basis of black holes and his experimental work, physicists (including him) suspects that goes wrong somewhere on the small scale, a scale which we have not been able to reach yet.

Andrea Ghez is the third Nobel Prize winner for Physics this year. She is the fourth female to be awarded the Physics Prize and she takes this award to encourage more women to come into science. She admits that there is so much we don't understand about black holes (on a side note, we don't understand our college curriculums too). Her passion for the field is so much that she gets excited whenever she goes to the telescope and "sees the light that has been on a journey for over 26,000 years".

Emmanuelle Charpentier was awarded the Nobel Prize in Chemistry this year for the discovery of a genome editing tool, called CRISPR. Emmanuelle believes that the tool has grown a lot in the last 12 years, and it has made possible applications that couldn't be thought of. She also says that CRISPR has generated a lot of jobs in biotechnology and communication too. Despite CRISPR's success, she knows that there is still a lot to learn. She says that it is not about publishing a paper in Nature, Science or any high impact factor journal for that matter, but what one needs is a good story and time to do solid and deep work on any subject. Although she knows that CRISPR is a wonderful tool, she knows that it can't be used to edit multiple genes at a time and that some unwanted experiments may be carried out using this technology in the future.

Jennifer Doudna also shared the Nobel Prize in Chemistry this year for her work on the CRISPR-Cas 9 system. The best part about her work on the genome-editing tool is that the tool comes from bacteria, organisms that are much more primitive and not as complex as the human being.

Louise Glück, a Yale professor and winner of many awards including the Pulitzer Prize for her works. Her poetry has various themes and her works have been appreciated due to their rhyme and meter. Her first work, *The Firstborn,* came out in 1968. The only thing she is scared of after winning the Nobel Prize is losing her friends.

SOAPS & E. COLI

Soaps Vs Sanitizers: Which one is better?

The COVID-19 pandemic has brought to the forefront the prominence of washing/ sanitizing our hands well. Soap and water and hand sanitizer are two surprisingly simple ways that help us ward off infections. But which one is a better alternative? Let's find out.

Viruses like coronavirus have a defensive lipid bilayer which is amphiphilic in nature, so in water-rich environment lipids naturally form a shell with their heads towards water and tails away from it. This hydrophobic effect holds together the lipids loosely. But the right molecules can easily pry this layer apart and this is where soaps come into the picture. Every soap contains molecules called amphiphiles, which resemble biological lipids. These amphiphiles break the regularity of virus's shell by competing with its natural lipids and form bubbles around particles including virus proteins, virus RNA among others. Applying water washes these bubbles away. Hence, eliminating the risk of infections.

Hand sanitizers, on the other hand, work by coagulating the virus proteins. The alcohol in hand sanitizers penetrates the cell and ultimately coagulates the whole-cell leading to its death.

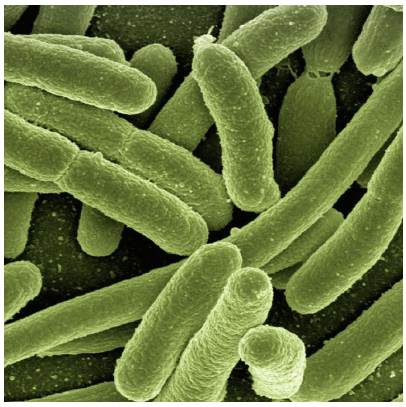
Even though both approaches have similar potency, the soaps have two benefits: first, it effectively removes away any dirt and second, it's more efficient in fully covering the hands while washing. Also, to be effective sanitizers must contain at least 60% of alcohol content and there are chances that it evaporates before hands are properly covered with it. But then again hand sanitizers are more expedient to use on the go, particularly in the absence of water.

But soaps take longer to act against virus-like rhinoviruses which cause common colds as they have geometric protein structure called capsid instead of a lipid bilayer and is harder to pry apart. However, surface proteins of such viruses are still susceptible to the destabilizing effect of the hand sanitizers and hence, in this case, they prove to be more effective.

Now let's compare soaps and sanitizers based on their probable side effects. Most soaps contain fragrances, which are absorbed by the skin and are known to cause allergies, asthma, endocrine disruption, neurotoxicity and even cancer. A component of these fragrances is phthalates which are additionally linked with causing developmental toxicity. Commonly used preservatives in soaps like methylisothiazolinone and methylchloroisothiazolinone are known to cause skin irritation, along with lung and respiratory issues. Sodium Laureth Sulfate (SLES) is another nasty chemical found in soaps and is carcinogenic in nature. But hand sanitizers are also no better. Irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD) are commonly reported skin reactions on using sanitizers. Triclosan is an antibacterial component found in sanitizers associated with hormonal disruption. It is known to weaken the immune system and has negative effects on fertility and fetal development as well. Antimicrobial resistance is increasingly becoming an important topic of major concern owing to the persistent use of hand sanitizers.

Though both soaps and hand sanitizers have their fair share of pros and cons, it's always advisable to follow the directions of accredited medical professionals in opting the one that suits a particular situation better.

E. coli that concentrates CO_2 from the air and then grows on it!



When scientists from UC, Berkeley and Israel have together developed E.coli that synthesized Rubisco and could survive on carbon dioxide, they knew there was a long way to go. Although this CO_2 utilizing E. coli could survive on artificially high levels of carbon dioxide, it couldn't use the atmospheric carbon dioxide. The reason behind this is the enzyme Rubisco needs high levels of carbon dioxide to function optimally.

So, they took a step further and incorporated the CO_2 Concentrating Mechanism (CCM) that plants use to provide optimal carbon dioxide levels that Rubisco needs. The result is a strain of E. coli that has 20 CCM genes from *Halothiobacillus neapolitanus* and can grow in lower levels of carbon dioxide that are usually present in the atmosphere. This work is instrumental in improving our understanding of how plants use carbon dioxide concentrating mechanisms and how the genes responsible for this feature work in sync. You can read more about the research here.

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1. Photos credits: Pexels, Pixabay
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BLAME IT ON THE GENES!

Ask anyone about genes and he/she will tell you about how genes are segments of DNA that code for a particular protein or are the reason behind a particular characteristic of ours. But what most of us don't talk about are genes other than those causing diseases and life-long discomfort to many. And, why should we?

Although we often think are a result of the environment we live in, we don't pay any particular attention to genes that shape our behaviors and personalities. This can be partly attributed to the "Nature" vs "Nurture" debate that we have all been a part of. But maybe it's time to think of the endless possibilities of genes having associations with ourselves in the way we never thought of. Perhaps, that is the reason we did a little bit of literature scouring to find out genes that control features we have never thought were linked to our genetic makeup.

Yes, some genes affect our sense of smell!

Scientists in Iceland set about exploring whether the notion that all humans have a similar sense of smell is true. They studied genomes from 11,000 Icelanders and tried to see if the people's sense of smell was affected by their genes. They asked participants to smell spoilt fish (did your nose crinkle just after reading that?) and asked them to identify it. While many participants correctly pointed out that it was fish, others said the smell was very similar to that of caramel and rose.

Scientists were able to narrow down this characteristic to be a missense variation in the TAAR5 gene, a gene which encodes one of the many olfactory receptors in our nose. Interestingly enough, they also found out that some variation in the OR6C70 led to people having an enhanced sense of smell for liquorice and cinnamon.

Not only does this study a signal that we have to throw the 'everyone-has-a-same-sense-of-smell' notion out the window, but also the fact that we can now blame ourselves spoiling fish to the reduced sense of smell as a mutation of the gene!

And there are genes that contribute to our creativity!

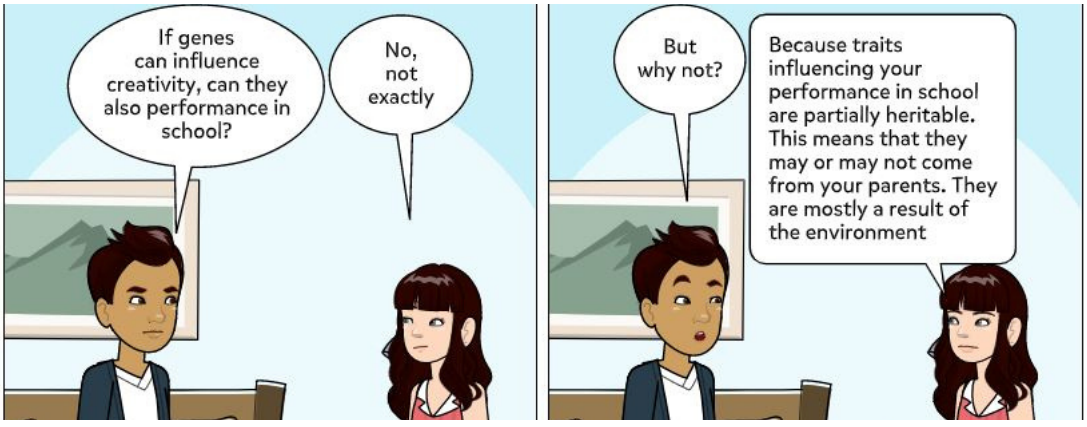
Although we may dismiss the term creativity as a function of our behaviors and personalities, science defines it as our ability to produce new responses to the same old problems. Researchers commonly use tests that are a measure divergent thinking capabilities to measure creativity in individuals. And needless to say, the research until now has given some interesting results and of course, information about genes!

Mutations/Polymorphisms in various genes are linked to our divergent thinking capabilities. A large number of these genes are dopamine receptor genes including Dopamine Receptor D4 (DRD4), D2 Dopamine Receptor (DRD2), and the Dopamine Transporter (DAT) gene. Other creativity-influencing genes are Catechol-O-Methyltransferase (COMT), Tryptophane Hydroxylase (TPH1) and the oxytocin receptor genes. Some scientists have also found some links between the mutations of these genes and convergent thinking capabilities. Maybe, it's time for us to start talking about our genes whenever we can't come up with something creative and funny.

What do you think? Is our creativity controlled by genes? Or are these links mere coincidences?

CAN GENES INFLUENCE OUR LEARNING?

Ever thought of what it would look like if we could blame the grades on genes? Wouldn't they make for a great excuse?



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a. Figure from sketchify, Cartoon made using Pixton Comic Maker.
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