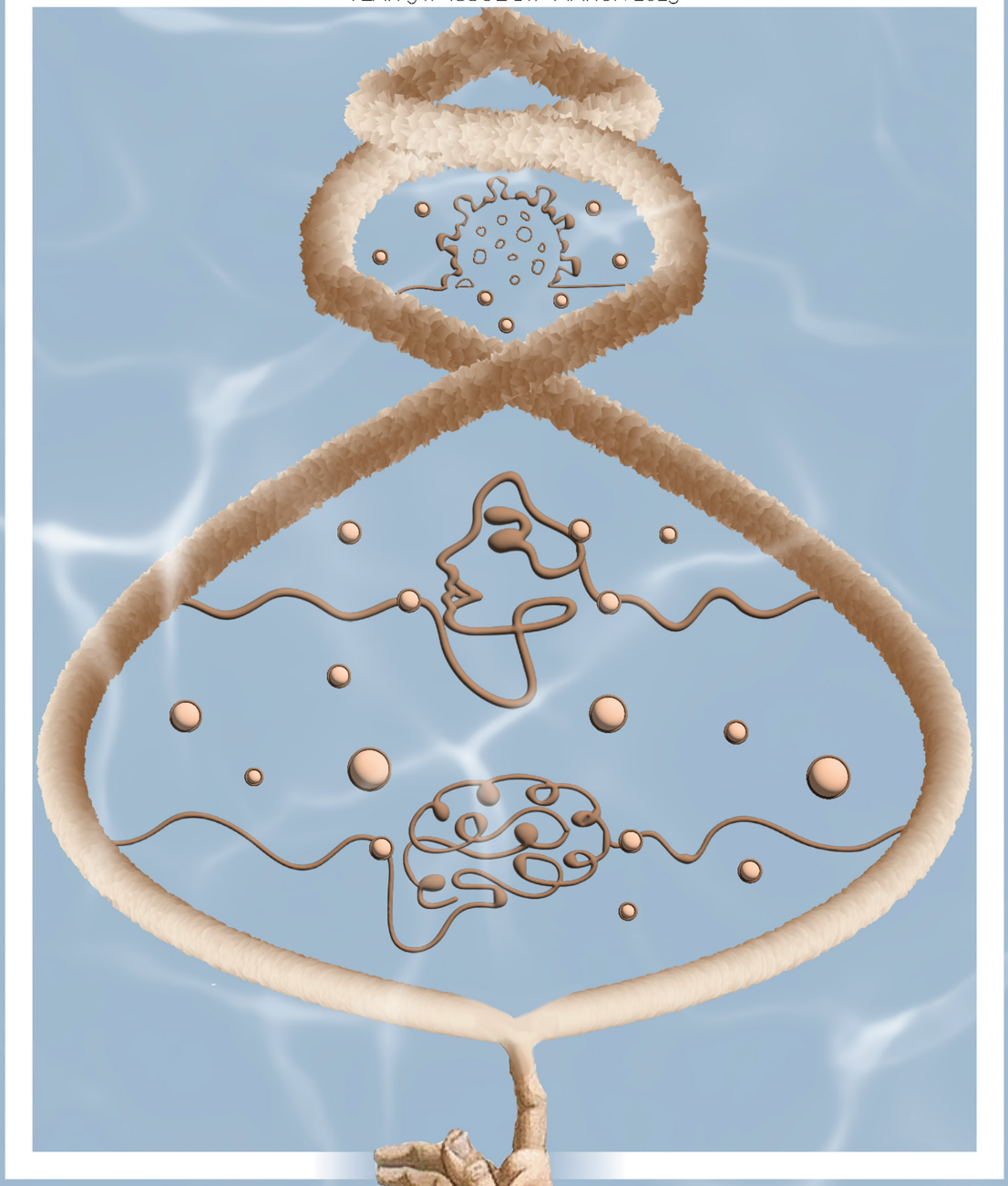
mRNA

YEAR 9 // ISSUE 1 // MARCH 2025



MOLECULAR GASTRONOMY // GUT MICROBIOME // LUCA NEWS // EVOLUTION OF MYTHOLOGY // BLUE ZONES // IMPOSTER SYNDROME // MURDER MYSTERY // MOSAIC STORIES //

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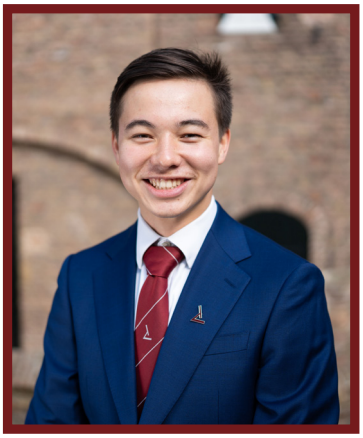
FROM THE BOARD

COLLIN DE MAAT

Dear reader,

As the days gently become longer and the sun shines more daringly, a palpable feeling of change hangs in the air. With it comes the promise of new opportunities, experiences and memories. But before we look too hastily as to what the future holds, I would like to take a moment to reflect on the year so far.



A lot has already happened this year, even before we all disappeared for our winter hibernation. We kicked off the year with the opening of the second lustrum (hoera!), "EVOLVE", with a rainy and overcast, yet cozy and enjoyable boat party on the Schie. Many career or academic broadening activities such as lunch lectures or the BEP-MEP Event took place. We voted on the proposal to install four new honorary members of S.V.N.B. Hooke, and we celebrated our association's tenth birthday with a week of celebrations. All this and we're still not even halfway there!

None of this would have been possible without the tireless dedication, passion, and enthusiasm of the rest of the board and Hooke's numerous committee members. Seeing this community buzz vivaciously, collaborating like a colony of bees, warms my heart. It also reminds me of a harbor, an area of safe refuge and rest, for ships who have weathered restless seas. From tired travellers seeking a serene stop, to motivated merchants peddling goods looking to forward their careers. Like the harbour, our community has it all. And that is thanks to all who pour their own time and energy into it.

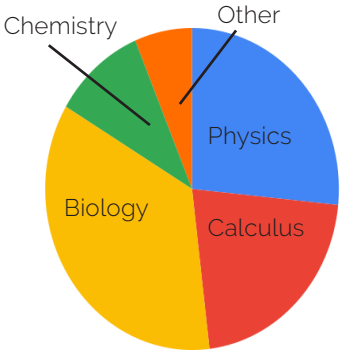
Gazing into the future I can truly see that we're just getting started and that so much more is to come. With festivities such as the gala and rally weekend to horizon broadening events like ASconnect and the symposium, I am sure that unforgettable memories are to be made and touching experiences are to be had. It all fills me with excitement and I am looking forward to seeing you all at these wonderful events.

I have spoken,

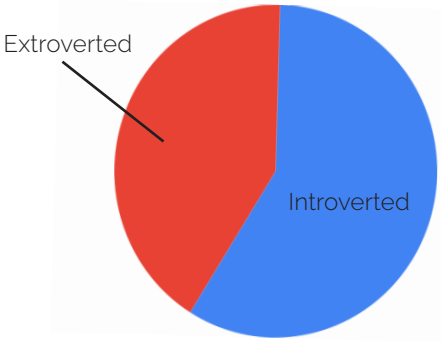
Collin de Maat
President of S.V.N.B. Hooke 2024-2025

PEOPLE OF NANOBIOLOGY

SURVEY



What was your favorite subject in high-school?



Are you extroverted or introverted?

personality type

- The influencial one: optimistic, extroverted and persuasive
- The steady one: peaceful, diplomatic and supportive
- The dominant one: competitive, result-oriented and strong
- The analystical one: logical, detail-oriented and accurate

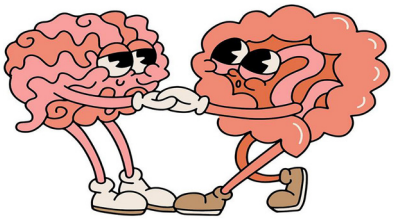
What is Nanobiology for you?

- "Nanobiology is a passion. It is a way of life, and a way of seeing life simultaneously. Without Nanobiology, there's no life, and with Nanobiology we have no life."
  ~ A passionate Nanobiology student
- "A way to make people think i am really smart while i am actually really dumb"
  ~ An honest Nanobiology student
- "Interdisciplinary field which allows you to understand biology through maths and physics."
  ~ A smart Nanobiology student
- "Hooke"
  ~ A cool Nanobiology student

HOW YOUR FRIENDS AFFECT YOUR GUT MICROBIOME

FROM HANDSHAKES TO GUT SHAKES

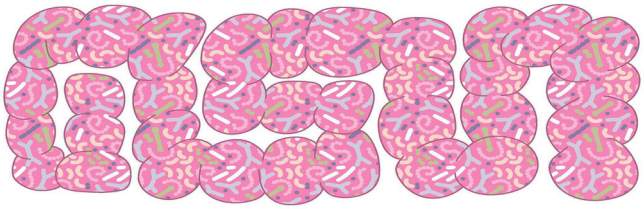
The gut microbiome is thought about as a rigid system tucked away in the curves of our intestines, but that is not completely true. Research has shown that our guts are actually much more sensitive to environmental factors, and this includes your friends.



The gut microbiome, often remarked as the second brain, does not only take part in digestion. It is also linked to the regulation of the immune system, and interestingly has been found to heavily affect your mood. [1,2] This is one of the reasons that having a balanced nutritional diet is important for preventing conditions like depression and anxiety. This ecosystem of bacteria that we carry in our tummies is far from a rigid system. It changes with many different factors, mainly with diet. But did you know that your social circle can also affect this biome?

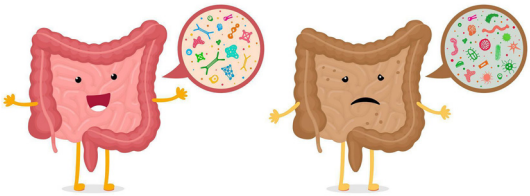
Research suggests that people who live in really close proximity to each other tend to share really similar gut bacteria. [3] This is not surprising when you think about all of the microbes that would constantly be exchanged through shared meals, physical touch, and generally breathing the same air. Furthermore, studies have shown that close friends and romantic partners have the closest gut microbiomes. [4]

So the shared habits and environments you have with the people around you may affect your health more than you think. If you and your friends like dining in a specific place, traveling as a group, exercising together, and taking the same classes, you are likely getting exposed to a similar set of bacteria.



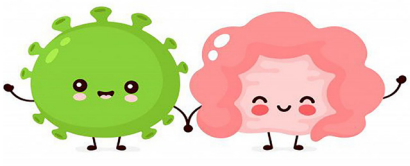
But we can also think about our broader environment when we think of the gut. A study has shown that people living in urban areas are exposed to a smaller range of bacteria when compared to people living in rural areas where there is more contact with soil, plants, and animals. So your friend's habits, whether you prefer hiking together or spending hours in cafes, can have an indirect effect on the range of gut bacteria you are exposed to. [5]

Having a gut microbiome composed of a diverse set of bacteria has been connected to many health benefits. [6] This is where your friends have been playing an unexpected role. Friends who are active and spend more time outdoors may help you lead a healthier microbiome by introducing you to a more diverse set of bacteria gained through activities and foods. To the contrary, social circles that are mainly centered around spending time in indoor spaces may not give the same benefits.



It can also be noted that friends who have a very different diet than you may expose you to other bacteria. This can be an unexpected benefit of having a culturally diverse friend group, where each individual has their eating habits tweaked by cultural differences.

Interestingly, next to proximity, social bonds also have an effect on the microbiome. Having the support of friends in regulating stress levels indirectly benefits your gut, due to the connection
the gut has to mental health. Positive social interactions that cause the secretion of positive hormones like oxytocin can be linked to maintaining a healthier gut microbiome. [7]



In summary, it isn't only fermented foods and fiber that can help your gut microbiome, but also the people you choose to surround yourself with. While diet and exercise are still the main factors affecting the gut, your social life and environments can also play a role. Spending your time with friends that value healthy habits, eating a diverse range of nutritious meals, and participating in regular activities and exercises not only motivates you psychologically, but positively affects you chemically and biologically.

In the end, your microbiome is the reflection of your eating habits, mental wellbeing, social circles, and surroundings. So listen to your parents, choose your friends wisely as you are in an active exchange of laughs, memories, and... microbes!

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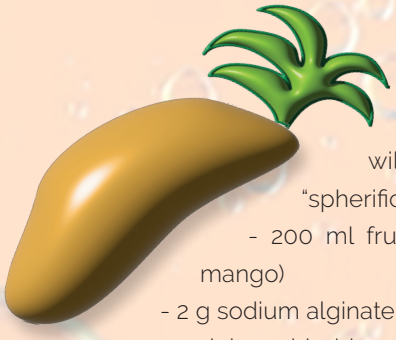
Images: Freepik and Vecteezy

REFRESHING RECIPE

MOLECULAR GASTRONOMY

Hello guys,

Been feeling starved lately? Maybe the stress of exams, work, or having a partner (lucky you- or unlucky if they're a Capricorn) has taken a toll on your psyche. Therefore, with no time to think about what to cook for dinner, you are probably relying on a typical Dutch cuisine: instant noodles, bread, and cheese. If you're growing tired from these delicacies, then this recipe is just what you need! We're going to cook up something that'll freshen your mood in these dark, gloomy times—and you can do it right from the comfort of your own kitchen: fruit caviar on top of mango foam, using the science of Molecular Gastronomy– chemistry in the kitchen.

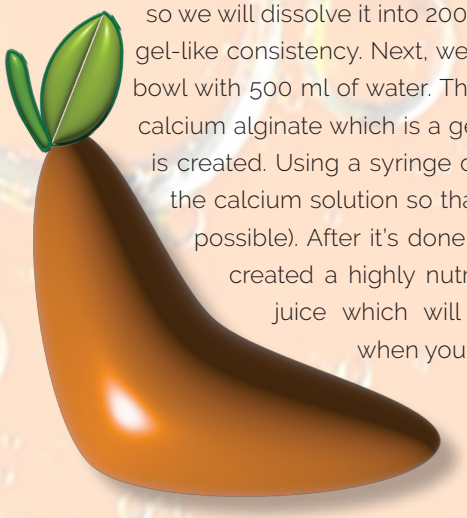


Fruit Caviar

For the fruit caviar we will implement a technique called "spherification". For that we will need:

- 200 ml fruit juice (like orange, watermelon, or mango)
- 2 g sodium alginate
- 5 g calcium chloride
- 500 ml water

First we need to prepare the sodium alginate bath, which you can obtain from any local supermarket. The compound is used as a thickening agent, so we will dissolve it into 200 ml of fruit juice using a blender, until we get a gel-like consistency. Next, we need to prepare a calcium bath in a separate bowl with 500 ml of water. The calcium will react with the alginate to form calcium alginate which is a gelatinous structure, so that a gel membrane is created. Using a syringe or a spoon we slowly drop the alginate in the calcium solution so that the balls are formed (as perfectly as possible). After it's done, just rinse the balls and you have created a highly nutritious and very filling ball of juice which will pop in your mouth when you eat it.



However, this is definitely not enough for a starving student, who craves more than just the bland texture of soft bread and unseasoned boiled chicken. Therefore, let's create some mango foam, so add on to the texture of the caviar. For ingredient we will need:

Mango Foam

-200 ml mango puree
- 200 ml water
- 1 tsp soy lecithin
- 2 tbsp sugar (optional, depending on how much you like sweet treats, you big back)

First we need to blend the mixture of the mango puree, water and sugar using a blender. Make sure you clean the one from the caviar, don't be nasty. Now we need to add the soy lecithin, which is used as an emulsifier (meaning it encourages the suspension of one liquid into another). We blend this on high for 1-2 minutes. Then, using an immersion blender, we continue blending until the foam appears.

Now you can enjoy a flavorful foam with caviar, a truly refreshing treat. But beyond the absolute delicacy we've created, you can now truly visualize how important chemistry is—not just in lab experiments, but also in day-to-day life. People use concepts like "Molecular Gastronomy" not just for funny articles, but to develop extraordinary techniques for preparing food. If there were once a limited number of food preparations, now the sky's the limit.

As I presume you're not a culinary connoisseur, these ideas might not excite you. However, if you buy some sodium alginate, you can impress your friends at dinner with fruit bubbles!

Sources:www.gourmetfoodworld.com.

FROM A-T C-G FIND YOUR PERFECT MATCH

ENZYME PERSONALITY QUIZ

From nucleotide complementary base pairing to enzyme-substrate complexes, biology works in pairs. If even the tiniest cells and chemicals have counterparts and partners, so why don't you deserve one as well. And since we're all looking for that one special fluorescent individual. We've decided to compose a compatibility quiz for y'all to find out what kind of enzyme you are and who you can bond with.

Questions:

1. Where would you and your friends most likely hang out?

A: At a cozy café where we can chat and chill. points)

B: Out on a hike, climbing, or doing something active.

C: Anywhere exciting—karaoke, an arcade, or a party!

2. What's your ideal role in a group project?

A: I like to organize everything and make sure it runs smoothly.

B: I'm the one who handles the difficult tasks under pressure.

C: I bring energy, enthusiasm, and motivation to the group.

3. How many previous relationships have you been in?

A: Just a few—I like to take things slow and steady.

B: A decent number—I put myself out there when I feel ready.

C: Too many to count! Life's about taking chances, right?

4. What's your go-to gift for your significant other?

A: Something meaningful, like a handwritten letter.

B: An experience, like tickets to an adventure.

C: A fun item that shows off my playful side.

5. What do your friends love most about you?

A: I'm dependable and there when they need me.

B: I'm great at making tough times easier for everyone.

C: I keep things fun, exciting, and unpredictable.

6. You're at a party. What are you doing?

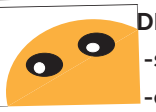
A: Making sure everything is running smoothly, like a low-key host.

B: Playing party games or chatting in small groups.

C: Dancing, mingling, and making everyone laugh.

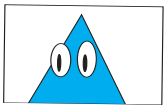
RESULTS

Mostly A



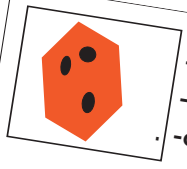
DNA-polymerase
-shy
-caring
-organized
compatible with B

mostly B



Gyrase
-likes to unwind
-confident
compatible with C

mostly C



Transposon
-hella extrovert
-confident
-charming :3
only compatible with themeslves

ALPHAFOLD

NANO NEWS I

The 2024 Nobel Prize in Chemistry was awarded to 3 scientists: Demis Hassabis, John Jumper, and David Baker. They were awarded this accolade for building an AI tool named Alphafold that is able to predict protein structures with incredible accuracy.

The first indication that Alphafold was really going to surpass other protein prediction methods was when it won the Critical Assessment of Protein Prediction (CASP) competition. This competition challenges competitors to predict the unpublished structure of proteins. AlphaFold2 was able to predict 95% of residues within 1 angstrom of its actual placement(purple line in graph below).

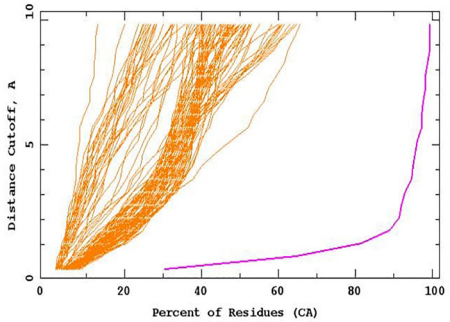
AlphaFold2 uses a neural network trained on extensive knowledge of protein structures and interactions. By entering an amino acid sequence, the tool scans millions of known protein sequences to find similarities and predict how the protein will fold. This method is called multiple sequence alignment(MSA). Chances are, this protein will have many conserved regions that can be predicted with confidence. AlphaFold2 also makes predictions on how likely certain residues are close to each other based on previous evolutionary relationships, using data from these known sequences.

However, proteins are highly complex structures, and identifying some conserved regions and basic interactions doesn't account for any long-range interactions or chemical restraints. This is where AlphaFold2's deep neural networks come into play.

The model integrates data from the MSA with additional information, such as predicted residue-residue distances and orientations, to account for long-range interactions and the physical and chemical constraints of protein folding. By constantly refining its predictions, AlphaFold2 can build a highly accurate 3D model of the protein structure, even for regions where evolutionary data may be lacking. This approach enables it to predict structures with remarkable precision, pushing the boundaries of what has been previously possible in computational biology.

It is of course still important to experimentally resolve the protein structure. Additionally, AlphaFold2 still has its limitations. It can't predict the positions of individual domains in multimeric proteins, nor can it resolve post-translational modifications or interactions with other molecules. Still, its accuracy is transforming proteomics, becoming a vital tool in many laboratories for predicting protein structures.

While experimental methods are still crucial for confirming protein structures, AlphaFold2 is a game-changer in computational biology. As it continues to evolve, it will likely play an essential role in future discoveries in the field.



Sources:
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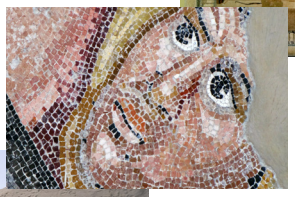
www.ebi.ac.uk/training/online/courses/alphafold/
predictioncenter.org/casp14/

WHERE FRAGMENTS TELL A STORY

ORIGINS OF MOSAIC ART

Mosaic art, famously known for its patterns made by small pieces of stones, is an important type of art whose history can be traced back to ancient Mesopotamia, around the 3rd millennium BCE. Early mosaics from this time were created using easily sourced materials like different colored pebbles and stones, and they were used on floors and walls of temples, carrying symbolic and decorative purposes.

One of the earliest examples of mosaics can be found in the Sumerian city of Uruk, which is located in Iraq today. In these mosaics, small colored stones and shells were used in building columns to create geometric patterns. Though relatively primitive in technique, these pieces made the groundwork for the development of this art piece in the following centuries.



[1] Uruk Mosaics in Mesopotamia - Currently Warka, Iraq]

The Greeks advanced in mosaic art in the 5th and 4th centuries BCE by integrating cut stones and ceramic pieces, known as tesserae, into their mosaics. They also refined the use of color in their ceramics, creating different shades, and hues. This allowed Greek artists to create mosaics with more precision and dynamics, and they were able to start depicting mythological scenes, nature, and daily life. They often made their mosaics on floors featuring geometric patterns and depictions of gods and heroes.

In the Roman Empire, mosaics became a widespread decoration in homes, public baths, and public buildings. Wealthy Romans would commission artists for floor mosaics to display their status. Often, the themes of these mosaics would be mythological scenes of feasts, hunts, and landscapes. Roman mosaics often had a central panel, known as the emblema, that would be surrounded by geometrically shaped borders.

[2]

Alexander Mosaic from the House of Faun in Pompeii, Currently in Naples, Italy

An important development of mosaic art during the Roman period was the widespread use of opus tessellatum, a technique that used small square tesserae in the creation of mosaics. This allowed Romans to create pieces with great detail and precision. Another technique that they developed was opus vermiculatum, in which tesserae would be aligned in curves to create depth in the mosaics.

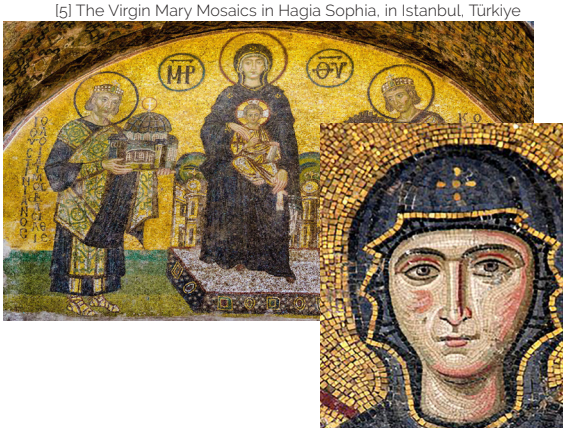
[3] Zeugma Mosaic, currently in Gaziantep, Türkiye

Perhaps the most important development was that the Roman Empire introduced mosaic art to many new regions, from North Africa to Britain, and each region began to develop its own styles and motifs. For example, African mosaics often featured vibrant colors and depicted animals and natural scenes.

[4] The House of Neptune and Amphirite at Herculaneum currently in Naples, Italy

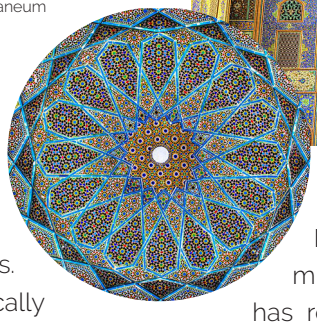
During the rise of Christianity in the 4th century CE mosaics started to be used in early churches to depict biblical stories and religious themes. The Byzantine Empire, specifically Constantinople, became the center of mosaic art. Mostly known for their use of gold tesserae, Byzantine mosaics created shiny and ethereal backgrounds for their depictions of the Virgin Mary and Christ in churches. Unlike Greek and Roman mosaics, the mosaics were mainly made on walls and ceilings, mainly due to the religious themes depicted.

[5] The Virgin Mary Mosaics in Hagia Sophia, in Istanbul, Türkiye



Following the decline of the Byzantine Empire, mosaic art started to be heavily implemented in the Islamic world. Due to religious restrictions, rather than depicting human figures, Islamic mosaics focused on geometric patterns and arabesques. Also, the advancements in geometry and mathematics during this time were reflected in the mosaics that decorated the walls of mosques and houses of wealthy individuals.

[6] Mosaics in Isfahan, Iran



Mosaic art has evolved over millennia and across regions, and has reflected the values and cultures of the people who created them, and they have given archeologists and historians many insights.

Today, this art is still evolving and mosaics remain as a visual representation of small intricate pieces that make up a whole image. I believe that mosaics carry a lesson within them: we can see the world as a mosaic, with its uniquely different people that together create something much greater and beautiful.

Source
[1]https://archaeology.org/issues/november-december-2012/features/features-zeugma-after-the-flood/
[2]https://smarthistory.org/alexander-mosaic-from-the-house-of-the-faun-pompeii/
[3]https://archaeology.org/issues/november-december-2012/features/features-zeugma-after-the-flood/
[4]https://www.ancientworldmagazine.com/articles/neptune-amphitrite-mosaic-herculaneum/
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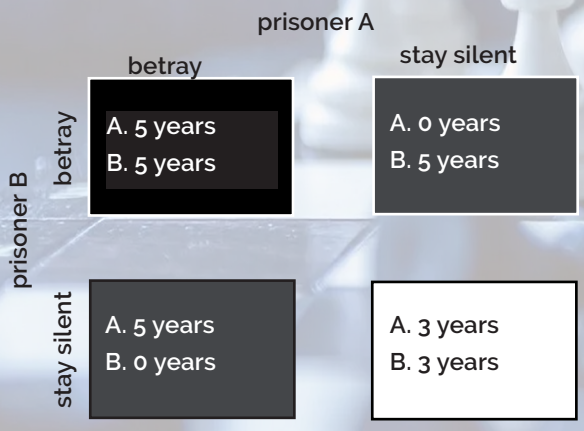
GAME THEORY AT WORK
THE PRISONER'S DILEMMA

Cold. Alone. Caught. You and your partner just tried to rob a bank, but now you find yourselves sitting alone in separate cells. Then, the officer approaches with an interesting proposition: Betray your partner, and you'll walk free while they face a harsher sentence. Stay silent, and you'll both serve time. Sounds like an easy choice, right? That is, until you realize your partner has the same options...

The basics:

This situation is known in game theory as the Prisoner's Dilemma. It's a scenario where two participants must decide between betraying or cooperating with their partner–without knowing the other's choice. The dilemma arises because the best scenario for both participants is if they actually both stay silent. However, when applying game theory and cold logic, each player is incentivized to betray the other, even though this leads to a worse outcome for both. But why is that? Let's break it down.



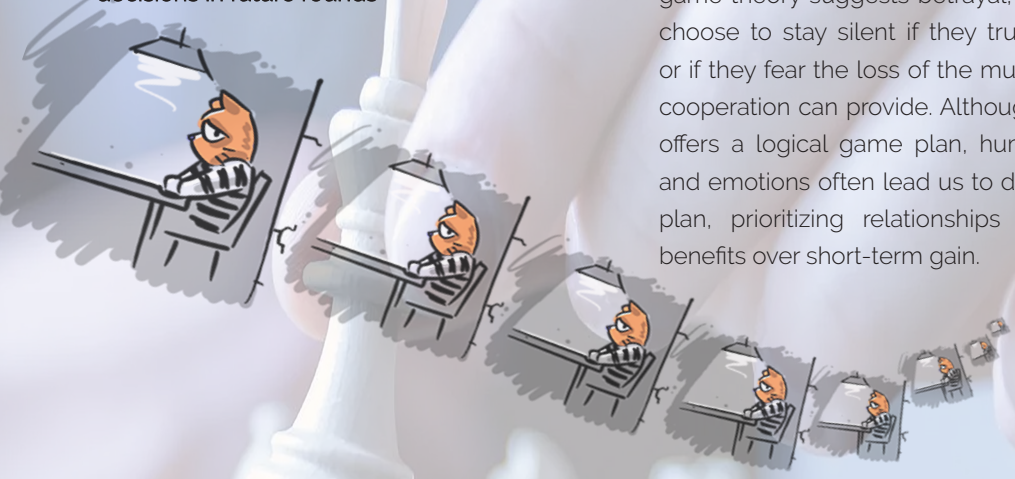
Why defecting is the optimal play

At first glance, it might seem like staying silent and cooperating with each other is the right choice. But when we analyze the possible outcomes, we see why that's not the case:

If your partner betrays you then no matter what your decision is, you'd still get the worst possible outcome. And if you look at the outcome matrix, you see that betraying results in a higher personal gain(instead of 3 years, you get 0). Since betraying and staying silent both have the same outcome if your partner betrays you. It leads to the natural cnclusion that betraying is always the optimal choice.

But how do the strategies and dynamics change when playing repeated rounds?

In this version, cooperation could actually become a viable strategy, even though betrayal still offers the same personal benefits as before. Why is that? The key difference—and what sets this version apart from the single-round game—is that the decisions made in one round affect the decisions in future rounds



Strategies and tactics for the infite prisonner's dilemma

After several rounds, players begin to build a relationship based on their past decisions, which influences future choices. As a result, starting with cooperation and working to build trust can be a powerful strategy for encouraging long-term cooperation and mutual benefit. Another effective strategy is Tit for Tat. This strategy starts by cooperating in the first round and, as the name implies, mirrors your partner's last move each round. If they cooperate, you cooperate; if they betray, you betray. It sends a clear message: if they're willing to cooperate, you'll cooperate too.

The Message

While the math shows that betrayal is always the best choice in a single-round game, human psychology adds another layer to decision-making. In real life, people don't always act on strictly logical decisions, like always betraying to maximize personal gain. Emotions and trust have a significant impact on decisions. While game theory suggests betrayal, a person might choose to stay silent if they trust their partner, or if they fear the loss of the mutual benefit that cooperation can provide. Although game theory offers a logical game plan, human experience and emotions often lead us to deviate from that plan, prioritizing relationships and long-term benefits over short-term gain.

Thank you Fotosynthecie for yet anoth

her wonderful semester in pictures!

IMPOSTER SYNDROME AT UNIVERSITY

OVERCOMING SELF-DOUBT

Some variation of the phrase, "How is everyone able to get this except for me?" is not foreign to any of us here at the Delft University of Technology. Imposter syndrome often thrives in environments where high expectations meet high achievers, making universities, especially ones like TU Delft, a fertile ground for these feelings. High school may have been a place where grades came relatively easily—either through consistent effort, natural intelligence, or a combination of the two. But, after seeing your first few grades at university, you're hit with a harsh reality check of what kind of work you actually need to put in to get a passing grade (or a grade that's satisfactory to you).

However, imposter syndrome isn't always something that fades away with time. Workload and expectations continually shift, often outpacing your ability to "get comfortable." You'll finish a course that you thought was one of the hardest classes you've ever had to endure, start your next course, and suddenly laugh at your past self for thinking that was tough. You'll go into a final exam confident that this is finally the subject you will excel at, the one that proves you belong, only to be met with a humbling grade. Imposter syndrome's cruel irony is this: It never leaves you alone, but it does leave you feeling alone.

So how do you get rid of this feeling? There is a conglomerate of ways to do this. The first is to realize, and to truly understand, that almost every one of your peers around you has, is, or will feel like this in some part or all of their university career. Even though you feel alone, this imposter syndrome is a commonly shared experience, and taking comfort in this fact will help. You must also realize that you've taken the time to attend this university, to pursue this degree that is going to set the course of the rest of your career. Yes, you're here to get grades, but what you learn from TU Delft, either inside or outside the classroom, is what you will truly carry with you 10 years from now, not the grade you got on some exam in a random quarter of your first year. Finally, the entire thought process behind imposter syndrome is built on comparing yourself with others. If you decide that your peers' success is a metric for yours, you will never escape this feeling. It will only manifest into something deeper and more hurtful for you and for others. The very fact that you're at TU Delft, tackling some of the toughest courses in the world, is proof that you're capable. Imposter syndrome may not disappear entirely, but with time, perspective, and support, you can learn to quiet that inner critic and focus on your growth.

Sources: structurae.net

WHAT TU DELFT STUDY ARE YOU?

A FUN, HARMLESS QUIZZ*

Have you ever wondered what TU Delft study best represents you? No? Oh, come on. You definitely have. Well, this quizz is perfect for you to finally receive the long-awaited answer to this every day question of yours! Just answer each question and sum up the points you get for each answer. Good luck!

1. What's your favorite way to solve a problem?

A. Hack together some code that works… hopefully without crashing! *+ 1pt*
B. Imagine a solution that involves rockets. Everything's better with rockets. *+ 2pts*
C. Scream-sing the Nano song to summon the Nano gods for help. *+ 4pts*
D. Channel your inner Bill Nye and dive into an experiment. *+ 3 pts*
E. Whip out your toolbox and just build something to fix it. *+ 2pts*

2. What's your ideal Saturday activity?

A. Debugging code… which takes way longer than expected. *+ 2 pts*
B. Watching a SpaceX livestream and yelling, "Go, little rocket, go!" *+ 1 pt*
C. Hanging out with friends and maybe going out. *+ 4 pts*
D. Making your own kombucha and feeling like a bio-genius. *+ 3 pts*
E. Turning a pile of scrap metal into something that kind of resembles a robot. *+ 2 pts*

3. What's your favorite building on campus?

A. EWI (pronounced "ew-wee," and also known as the autistic tower). *+ 1 pt*
B. The aerospace faculty. *+1 pt*
C. TNW, duh! *+ 4 pts*
D. No building, just the patch of green along the tramway. *+ 3 pts*
E. 3ME (which is now for some reason just called ME). *+ 2 pts*

4. How do you relax after a long day?

A. Hiding away in your windowless, musty room. *+ 1 pts*
B. Relaxing is for the weak. *+ 3 pts*
C. Settling down with a nice book and a cup of tea. *+ 4 pts*
D. Taking a walk in nature. *+ 3 pts*
E. Fixing a squeaky door, even though no one asked you to. *+ 2 pts*

5. How do you react when you cross a girl on campus?

A. Hiss, because what is this creature you have never seen before in your life?? *+ 1 pt*
B. Hide, because you don't know how to be near one. *+ 1 pt*
C. It doesn't do anything to you… they're just normal humans? *+ 4 pts*
D. Ask her out. *+ 2 pts*
E. Talk to her about Bitcoin. *+ 2 pts*

Results:

5-7 points: You are Nanobiology! You are the best study at the TU Delft. You may be small, but you are mighty! You are awesome and everyone loves you.

7-9 points: You are Life Sciences and Technology. You are a bit *suf*, but you share a faculty with the coolest guys in town (the Nanobiology people!!) so that earns you some social credit.

9-11 points: You are Mechanical Engineering! Probably the least original study in every university ever. You're not quite sure where you are leading students, but hey, at least your faculty looks cool.

11-13 points: You are Aerospace Engineering! You know that women exist, but most days, you forget what they even look like. Don't fret, though; women are temporary, but rockets are forever!

13+ points: You are Computer Science! You should probably take a shower and go outside. How long has it been since you last did that? A week? A month? I can smell you through this page, sheesh!

*Disclaimer: mRNA 9 is not responsible for any offense caused by the results of this quizz. This quizz is completely fair and has definitely not been formatted to almost always output either Aerospace Engineering or Computer Science when giving somewhat normal responses to the questions.

FIGURATIVE LANGUAGE IN SCIENCE

LANGUAGE

Captivating narratives, embellished with imagery and metaphors, immerses readers in unfamiliar, abstract worlds. The power of figurative language in literary works is celebrated. On the other hand, science has a reputation for having high standards for objectivity. Thus, it may seem like figurative language is incompatible with science.

Engaging with science is important in addressing today's critical issues. Therefore, writing is an important means of sharing and evaluating science. It impacts how people perceive science and form opinions – it can deter interest or mislead. How often do you think you use metaphors? And when 'talking science'? This essay explores if the use of such literary devices impede, retain, or maybe even improve our understanding in science.

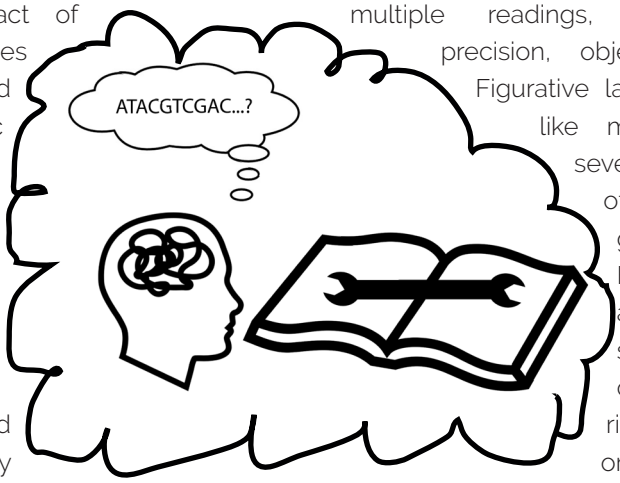
What Should Scientific Language Be Like?

Scientific language, whether interpretive, descriptive, or explanatory, should limit ambiguity and maintain precision and clarity. As a consequence to the **scientific method**, science relies on objectivity, reproducibility, precise definitions, and clear communication of findings. The intention is to ensure ideas are true and that knowledge is applied ethically. Scientific texts often follow inductive reasoning and logical structures, so objectivity when describing observations is essential. For instance, low-modality verbs like 'suggests' are used to indicate tentative conclusions, whereas more established paradigms are referred to with high-modality terms like 'laws.'

Impacts of using Figurative Language

Firstly, metaphors can act as conceptual tools to improve understanding of abstract scientific ideas. By comparing complex concepts to familiar ones, metaphors and analogies make them more accessible. For instance, describing DNA as 'an instruction manual for building proteins and guiding cellular functions' helps laypeople grasp its role in biology. Furthermore, metaphorical models also make scientific ideas more intuitive, especially when abstract theories are difficult to interpret through raw data alone. While human cognition is not strictly dependent on language, language, including metaphors, provides a framework for organising and formulating thoughts. Quantitative results often need metaphorical models to translate numbers into comprehensible concepts. Moreover, metaphors can inspire unexpected insights across contexts. For example, Richard Feynman saw someone throwing a plate and the air. He saw how it both spinned and wobbled, but at different rates. He worked on equations to describe this motion. Surprisingly, these become useful in understanding how electron orbits start to move in relativity. Feynman described this process as "effortless" play, demonstrating how metaphors and analogies can lead to breakthroughs by offering intuitive frameworks for exploring complex phenomena. This demonstrates how metaphors, as cognitive frameworks, can communicate complex ideas.

Secondly, figurative language can create ambiguity when conveying scientific ideas. It relies on connotation, implied meaning and personal **interpretation** — which have the potential to obscure meaning. While open interpretation can enrich literature, it weakens scientific writing, which prioritises precision and unambiguous ideas aligned with (usually) a single paradigm. Additionally, metaphors are not testable or measurable, making them less useful in science.



Lastly, the impact of scientific messages can be amplified through rhetoric and figurative language, but this raises challenges for objectivity. Language is inherently shaped by its context and audience, and rhetoric inevitably influences how messages are delivered and received. While the scientific community strives to minimise rhetoric in research to maintain objectivity, it becomes unavoidable when science is communicated to broader audiences. In popular science, for example, metaphors and analogies can effectively engage non-expert audiences, making complex ideas accessible and inspiring curiosity. Richard Dawkins' personification and metaphors in *The Selfish Gene* are memorable and impactful to many. However, they may oversimplify or distort scientific nuances. Conversely, rhetoric can have negative implications when misused. Sensationalised language, such as referring to rudimentary findings as 'groundbreaking' or overstating risks in headlines like 'Gene Editing Will Destroy Humanity,' can mislead audiences. In effect, figurative language that uses rhetorical devices risks adding subjective layers to objective findings. Balancing accessibility and accuracy is critical when communicating science to broader audiences. In conclusion, scientific language, much like literature, has the power to shape how we understand and engage with the world. However, while literature can embrace multiple readings, science demands precision, objectivity, and clarity. Figurative language and devices like metaphors can fulfil several functions — use of analogies can bridge gaps in understanding. However, metaphors, as rhetorical devices, should be used with care, as they can risk oversimplifying or distorting scientific ideas, especially when employed for persuasion or sensationalism. Ultimately, we should stay true to objectivity in science and recognise when it is compromised by the subtle cues of language and context.

GAME THEORY FOR DUMMIES

HOW TO BEAT YOUR FRIENDS AT ANYTHING

You and your roommate have been arguing over the pile of dishes for over a month now and it has finally reached a breaking point. You settle the dispute in an old-fashioned game of rock paper scissors. Is there any way to increase your odds and avoid doing the dishes? Let's find out !

This question brings us to the heart of game theory—the study of mathematical models that help explain strategies and decision-making. It applies to everything from board games like Monopoly and chess, to everyday situations like negotiating at work or deciding which route to take during rush hour.
One of the core principles in game theory is anticipating the potential outcomes of each decision you make and using that to plan out your next moves. To do so we look at the key element that define a game namely;

Players: Who's involved in the game?
Rules: What are the possible moves or optionsc?
Payoffs: What's at stake, and how does each move impact the outcome?
Information: What do you know about your opponent's actions, and what might they know about yours?

But how can we use these elements of game theory to get an edge? Let's look at a few scenarios where these principles can tilt the odds:

Social deduction games (Mafia, Werewolf, Among Us)
Look for personality changes. Most people get so excited when they get the "traitor role they get a complete 180 flip in personality. So by analyzing the given information and their payoffs you can differentiate who's playing for which team

Resource games (Catan, Monopoly, etc.)
In resource-based games like Catan, controlling key resources gives you a significant advantage.
by monopolizing essential resources you limit your opponent's options and force them into unfavorable trades. Since the only moves require complete accessibility, boycotting allows for complete control of the flow of the game

Card games
Abuse the fact that the deck is known and distributed between players, so based on the behaviour of players and the cards in your hand, you can figure out where each card is.

Use these strategies the next time you play—game theory might just give you the edge you need to win.

OUR FAMILY TREE: LUCA

NANONEWS II

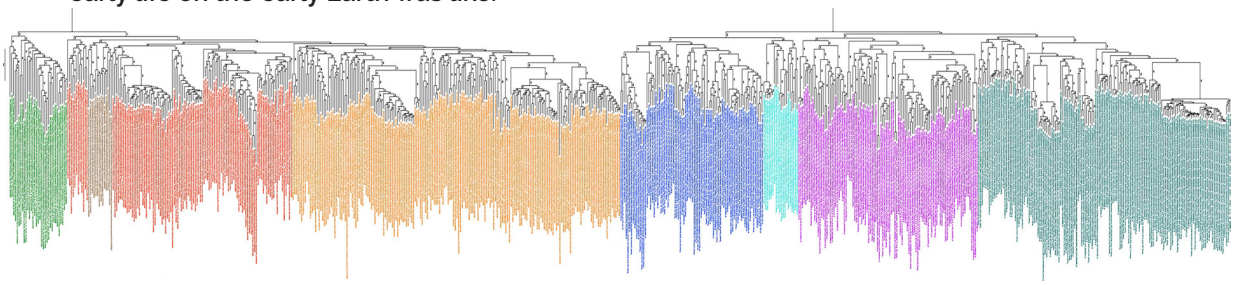
We're all related, aren't we? Rooted in Darwin's theory and observations of genes shared by all modern life, the notion that all life shares a common ancestor is familiar to us. However, less is known about the last universal common ancestor, LUCA, from which all modern life evolved from. What is the last surviving organism we can all trace our ancestry to? Understanding LUCA could reveal the foundations of life's essential functions and biochemical pathways. A 2024 paper by Moody et al. proposes the most complete collection of LUCA's genes yet, as well as insights into what LUCA was like, when it lived, and the conditions it thrived in. Through use of a combination of techniques, this study raises intriguing questions to what early life on the early Earth was like.

The previous understanding had been that LUCA was a simple organism, yet recent research has shown that the common ancestor was more complex than previously believed.

The method used by Moody et al. combined techniques from multiple fields. The comparison of genomes of over 700 bacterial and archean species was performed to create a probabilistic tree and infer which genes are likely to have been conserved over billions of years. Subsequently, a comprehensive collection of LUCA's genes was established -- from which its encoded protein and metabolic pathways were deduced.

Maximum Likelihood species tree

Moody et al., doi: 10.1038/s41559-024-02461-1



LUCA is not the first living organism but rather the last surviving organism, or more likely population, that evolved into all modern life. Previously, the molecular clock technique was used to estimate the timing of LUCA's existence. However, this method of predicting the time of evolutionary divergence using mutation rates has limitations — mutation rate is inconsistent across genes and earlier mutations can be reversed by subsequent mutations.

The results suggest that LUCA had a phospholipid bilayer and, surprisingly, carried out complex functions such as nitrogen exchange and an early form of the CRISPR-Cas9 immune mechanism. It was also predicted that LUCA lived around 4.2 billion years ago. This leads to several implications to ponder: (1) life arose more quickly on Earth than we predicted, (2) the early Earth had intricate ecosystems, (3) the operation of an immune system in organisms may suggest the existence of viruses at the time.

HOW TO LIVE FOREVER

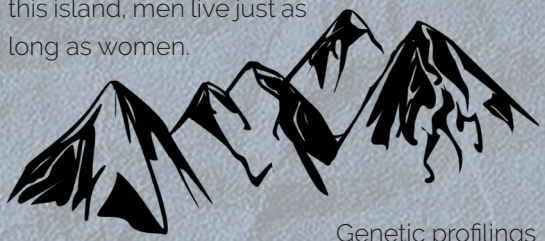
BLUE ZONES AND LONGEVITY

Have you ever watched a video on the internet of some guy doing something very stupid--like jumping into a swimming pool from the roof of a house, doing a side wheelie in a car, or swallowing 5 hot dogs in a row without chewing--then, you open the comments, and there's always one that says, "and this is why women live longer than men..."?

Well, that statement is not completely unfounded, although the reason behind it is not simply that men do more dumb stuff than women (though that is also debatably true). In fact, in the developing world, women live an average of six to eight years longer than men. That's a huge gap, which can be explained by a whole lot of factors—though the most important one might catch you off guard.

To study longevity, we should look at the places in the world where people live the longest: these are called the "blue zones," and there are five main ones in the world: Okinawa Prefecture, Japan; Nuoro Province, Sardinia, Italy; the Nicoya Peninsula, Costa Rica; Loma Linda, the USA; and Icaria, Greece. And if you're wondering why they're called blue zones: it's simply because when scientists were studying longevity around the world, they marked the villages with the highest life expectancies with a blue pen.

The original study involved the region of Sardinia: a remote, mountainous Italian island in the Mediterranean, between Corsica and Tunisia. Super-longevity, often defined as living above 100, is common to both sexes. There are six times as many centenarians (people older than 100) in Sardinia as on the Italian mainland, less than 300 kilometers away, and 10 times as many centenarians as in North America. On this island, men live just as long as women.



Genetic profilings showed that genes only accounted for 25% of their longevity; that means that the other 75% is lifestyle. So, what does it take to healthily live to 100 and beyond?

Classic assumptions would say that they probably have a balanced, whole diet, and clean air, and that walking every day through mountains probably gives them a good dose of exercise. However, a study of over 10,000 middle-

aged people looked at various aspects of their lifestyles over many years to rank which were the most powerful predictors of longevity. The results might surprise you.

While clean air is nice and all, and not being overweight is also valued, higher on the list was not drinking, and even higher, not smoking… but the top two predictors, almost tied for first place, were close relationships and social integration. Close relationships are the people who you can fall onto if you are ever in a tough spot, the ones that you know will be there for you in hard times—and apparently, three stable relationships is the magic amount.

The slightly more unexpected predictor is what's called 'social integration': that is, how much you interact with people throughout your day. This includes both strong and weak bonds; so, for example, talking to the barista making your coffee every day, saying hi to the bus driver, or being part of a book club. Even something as simple as making eye contact and smiling at someone you cross in the street will contribute to your longevity. Face-to-face contact, even in its simplest form, is enough to release oxytocin, which increases your level of trust and lowers your cortisol (so, stress) levels.

So, going back to the villages in Sardinia: there, houses are tightly spaced, with interwoven alleys and streets. The villagers' lives constantly

intersect. There, as people age, they're always surrounded by extended family, by friends, by neighbors, the priest, the barkeeper, the grocer… And that is the secret to their longevity. With the COVID-19 pandemic, we all experienced first-hand the difficulties and dangers of social isolation. As online life becomes more and more normalized, like online classes, remote work, and scrolling on your phone instead of talking, we are slowly making ourselves more susceptible not only to depression, dementia, and a weaker immune system, but also just a much shorter life.

So, cherish those around you, even the nameless faces, and as you go about your day, realize that every social interaction you have acts like a vaccine, precious to your health and longevity.

Sources:
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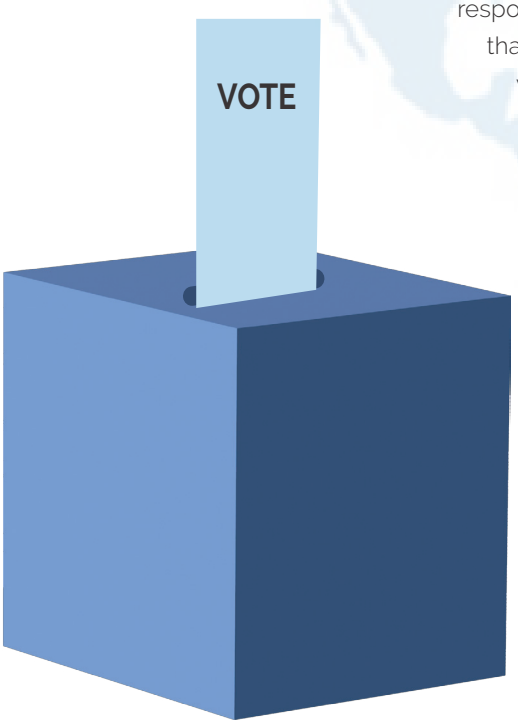
DEMOCRACY IS IMPOSSIBLE

NOT CLICKBAIT!!!

Are you always left disappointed by the people elected to run your country? Does your soul harbor deep suspicions about the electoral process that you, most likely a person above the age of 18, have participated in? Ever wondered if the lizard people are the ones constantly sabotaging your favorite political party from winning? Well, good news: those suspicions, which might have made you feel like a Reddit incel lost in conspiracy theory rabbit holes, actually have justification. But here's the kicker: it's not our split-tongued friends to blame. It's just the boring, everyday flaws in a system that, while designed to be democratic, still hasn't quite figured it out.

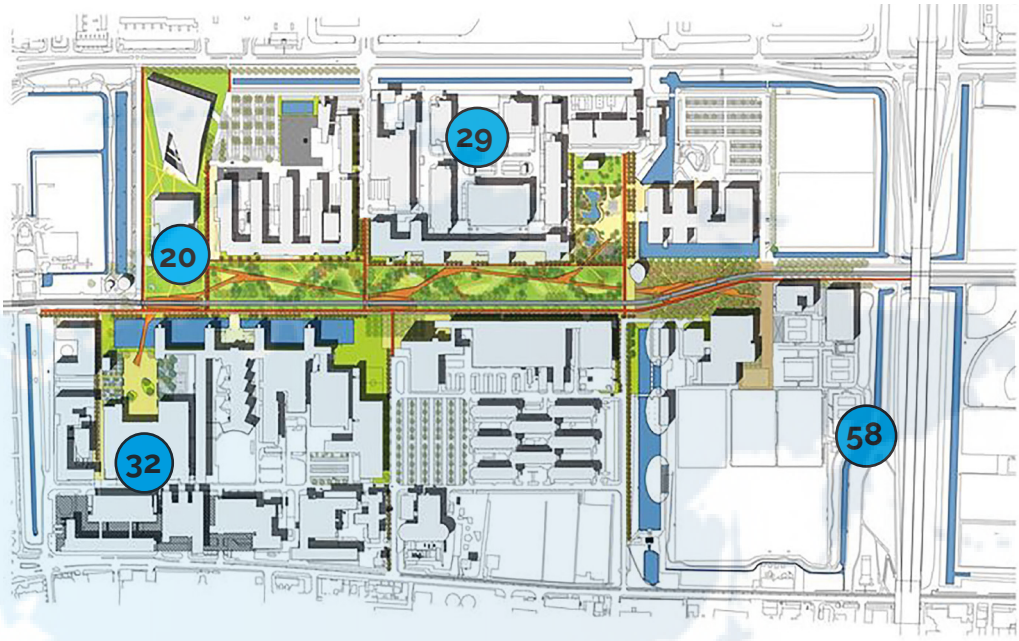
For this article, let's look at the map of the Technical University of Delft. Students from Buildings 58 (34), 20 (10), 23 (15), and 32 (17) need to vote on the next building for physics lectures. Assuming each student votes for the most convenient option, what's the best voting method to solve this crucial, life-altering dilemma?

The most common voting system is 'first past the post'—the one responsible for the UK election chaos (but I'm not going down that rabbit hole). In this method, each person casts one vote for their preferred location. As expected, Building 58 wins with 34 votes, but that's still a minority of the total electorate. For the 42 students from the other buildings, Building 58 is the most inconvenient. The truth is, 'first past the post' only works with two candidates. Otherwise, it's considered one of the worst voting methods, despite its widespread use.



What about other voting methods? One option is 'ranked-choice voting,' where each student ranks the buildings from 1 to 4. The building with the highest average ranking wins. It seems fairer than the previous system, but it's still

Sources: www.Ted.com



A simulation shows Building 32 would win, which aligns with most students' preferences. So, we found the perfect system, right? Not quite. In ranked-choice voting, voters sometimes cheat by ranking their real second choice last to boost their first choice. So, while it's theoretically better, it only works if everyone is honest.

"We've covered two widely used yet flawed voting systems. What are we left with? Disappointment and existential dread—or the Condorcet method. This system pits each candidate against every other in head-to-head matchups. For example, we compare Buildings 58 vs. 20, 58 vs. 32, and so on. The building that wins the most matchups wins the election. In theory, it minimizes voter dishonesty, but there's a catch: the Condorcet method can create a paradox. If there's a cyclical preference—say, 58 beats 20, 20 beats 32, and 32 beats 58—no candidate wins all pairwise matchups, leaving us in a loop."

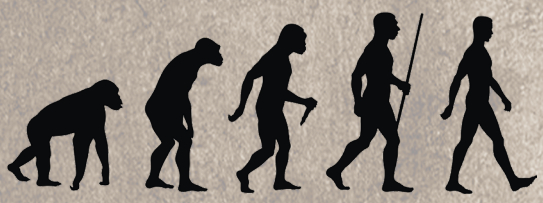
SO WHAT?

There are hundreds of constructed voting methods, like the ones I mentioned, however, the truth is that whenever there are more than 2 candidates, the voting process is exposed to extreme bias and flaws. As a result, it seems that true democracy is mathematically impossible, as none of the simulations rule out a unanimous true winner in any of the voting systems. In a system that is inherently broken, there is not much we can do about it. The most we can do is be truthful about our preferences, speak up for minorities so they don't drown in the sea of politics, and represent what we stand for.

WHY HUMANS DOMINATE THE EARTH

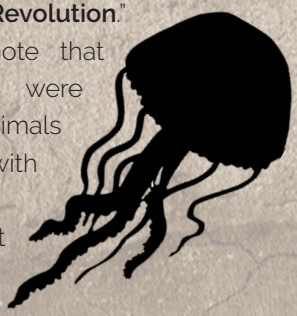
MYTH-MAKING AND COMMUNITY

Did you know that at least 15 human species have walked the Earth? And we could still discover even more! But today, we *Homo Sapiens* are the only remaining species. How did that come to be?

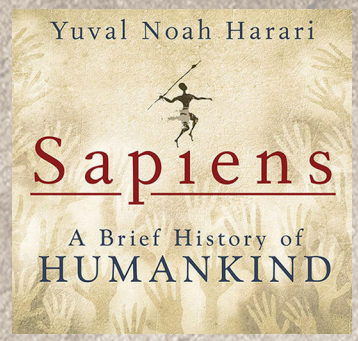


300,000 years ago, at least nine species of humans wandered the planet, and as recently as 40,000 years ago, *Homo Sapiens* still shared caves with Neanderthals and Denisovans. So, surely, if we managed to eradicate these other human species, that means we had a strong evolutionary advantage, right? But what was it?

Yuval Noah Harari presents a compelling thesis to answer this question in his book ***Sapiens***. Apparently, our DNA shows a mutation dating back around 70,000 years which allowed us to make a leap that no other species was able to make: cooperating in large groups with complex language. Harari calls this the "**Cognitive Revolution**."



It's important to note that prehistoric humans were just one of many animals on the savannah, with no more impact on their environment fireflies, or jellyfish.

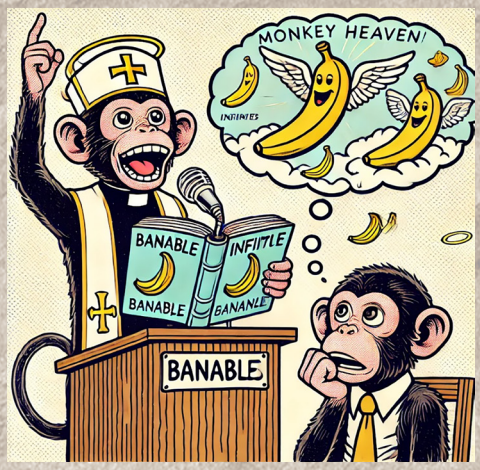


So, this revolution truly changed everything. Our newfound language had attributes that couldn't be found in any other animal species' languages. Firstly, we could give detailed explanations of events that had transpired, which could make for better coordination while hunting, allow us to warn others about dangers, and even propose cooperation between tribes. Secondly, we could gossip about each other. Discussing the benefits and disadvantages of having certain members in the tribe made it possible to optimise everyone's roles in the group and distribute food and other resources more fairly so as to incentivise members to work.

However, as important as both of these abilities were to the development of ***Sapiens***, Harari argues that they are probably not the main reasons why our "uniquely supple" language

gave us a massive survival advantage. The main reason was that we could talk about things that were **not real**. Sapiens could discuss "entire kinds of entities that they have never seen, touched, or smelled. Legends, myths, gods, and religions appeared for the first time with the Cognitive Revolution." Indeed, many animal and human species could say, "Careful! A lion!" But only *Homo Sapiens* could say "The lion is the guardian spirit of our tribe." As Harari says, "This ability to speak about fictions is the most unique feature of Sapiens language…You could never convince a monkey to give you a banana by promising him limitless bananas after death in monkey heaven."

So, the core of Harari's thesis is that **it is our collective fictions that define us**. He mentions religion as one of the most important fictions, but others are just as important: the concept of basic human rights; the nation-state; the concept of money itself. All these inventions allow us to do what other species cannot: cooperate effectively and flexibly in large groups. And you must note: these are not lies; we truly believe in them as a collective, which actually makes them exist in the context of our society. If you and I both believe in money, we can use it as an exchange of value.



Our success as a species is then intimately linked to scale. In all species but ours, as far as we know, there are hard limits to the number of individuals that can cooperate in groups flexibly. *Sapiens* diverged when it discovered an ability to generate a collective myth, and there was suddenly almost no limit to the number of cooperating, believing Homo sapiens who could belong to a large belief-group, and together, outlive and eradicate all other human species.

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BIOLOGY IS A STARTING POINT

RANDI

"Woman? Very simple, say those who like simple answers: She is a womb, an ovary; she is a female: this word is enough to define her. From a man's mouth, the epithet 'female' sounds like an insult; but he, not ashamed of his animality, is proud to hear: 'He's a male!'

-Simone de Beauvoir (1949)

I sometimes ask myself what the difference between men and women really is. Apart from the physiology, I can't seem to think of any real difference. Men and women are equal. I like to assume that is the way most people think about men and women, but there is a real difference between how a woman experiences day to day life compared to a man. Why is there such a difference in the way society treats men and women? When did the male sex become dominant over the female sex?

In nature, there are a lot of species where the females are stronger than the males, like bees, ants, some spiders and the praying mantis, where the female kills its male counterpart after coitus. However, this behavior is only consistently observed in captivity. In nature, if there is enough food around, the mantis does not kill the male.

There are also a lot of fish species where the males and females are equals. The sexes do not have more responsibility on the offspring than the other. The female fish will lay its eggs, and the male will fertilize them, after which they are left to their own devices. Even with primates there is a considerable number of species that are not male dominated (Lewis, R.J, 2023).

So if we, humans, are just a species which has been male dominated by default, why should we conform to our nature? Why can't we live according to our nature? Like Simone de Beauvoir (1949) said: "A society is not a species: the species realizes itself as existence in a society; it transcends itself toward the world and the future; its customs cannot be deduced from biology."

Beauvoir essentially says that the roles of men and women in society cannot be deduced from biology. We as a collective have chosen the roles of men and women. Therefore, we can change them. We can choose to live in a society where men and women are equals.

Sources

Beauvoir, S (1949), The second sex, The internet archive https://archive.org/details/1949SimoneDeBeauvoirTheSecondSex/page/70/mode/2up

Lewis, R. J., Kirk, E. C., & Gosselin-Ildari, A. D. (2023). Evolutionary patterns of intersexual power. Animals, 13(23), 3695. doi:10.3390/ani13233695

MURDER MYSTERY

DEATH IN THE TNW

A murder has occured at the TNW-Zuid. All was going well until an unassuming Nano student found the body of Collin, esteemed S.V.N.B. Hooke President. It is your job to find out who did this by solving this word search found in the victim's pocket. Each word has one letter amiss, you must rearrange the odd letters out to spell out the name of the killer:

A	R	N	T	N	O	S	I	Z	B	N	O	I	R
B	S	E	R	O	E	M	P	Z	B	A	S	N	P
O	O	C	A	D	T	D	O	R	A	N	S	A	O
S	B	O	N	A	L	S	S	R	C	O	R	S	N
A	B	O	S	N	L	C	Y	T	T	B	K	R	C
N	I	S	C	I	T	R	R	K	E	C	O	D	Y
A	O	I	R	E	Z	O	I	A	R	O	C	N	E
L	P	E	I	N	P	S	T	E	I	L	A	O	S
Y	H	B	L	Z	C	C	A	B	O	O	S	H	L
S	Y	I	T	Y	C	O	R	A	P	G	C	C	S
U	S	L	I	I	A	P	O	B	H	Y	L	O	K
S	A	E	O	E	H	E	B	B	D	I	O	T	I
A	C	O	N	S	R	A	A	S	G	G	C	I	A
M	S	N	Y	R	P	D	L	L	E	T	B	M	O

nanobiology

analysis

transcription

biophysics

mitochondria

bacteriophage

enzymes

Now, you must have solved the word search, with words in the word bank but one letter was amiss. Solve the word scramble with the erroneous letters to find who killed our president!

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Sources:

ar.inspiredpencil.com

webstockreview.net

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