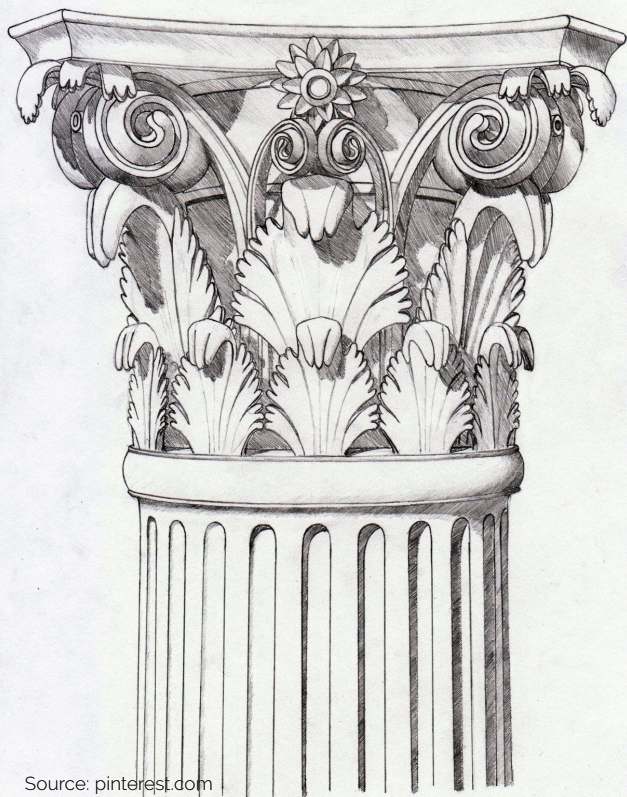


∞mRNA



YEAR 7 // ISSUE 1 // DECEMBER 2021

MYTHOLOGY STORIES // WHICH AMINO ACID ARE YOU // ALIENS //
BIOTERRORISM // NANOTALES // RIGHT TO REPAIR // INTRO TO LATEX



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CONTENT

3	Editorial
4	From the Board
5	Nanonews
6	Mythology Stories
8	mRNA x Booke Club
9	Microscopic Record Holders
10	The Right to Repair
12	Going Behind the Myth
13	Bioterrorism
14	Intro to Latex
16	Hooke Pictures
18	Aliens: the Modern Myth?
19	How Fast Could Winnie the Pooh Swim in Honey?
20	Which Amino Acid Are You?
21	Going Behind the Myth
22	Horoscopes
24	Rating Stuff on How Alive It Is
25	Follow a First Year
26	Nanotales
27	Randi: Sára Bánovská
30	Crossword Puzzle
31	Hooke Agenda

COLOPHON

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EDITORIAL

ANNEMIEKE MATHISSEN

Well hello there mRNA readers!

As you can see, there is a different face on this page – one that you are not yet used to seeing. Since the last time you read an mRNA edition, there have been some changes. You have started a new academic year, have already been through some exam weeks, and are hopefully cuddled up in your blankets during these cold months. Most importantly, mRNA has once again had to say goodbye to some older members, while greeting some new ones.



We are all here to learn a bit more about what writing is about, and build off of the foundations our predecessors have left for us. We wish to write with some new spins and takes, while trying to uphold the pillars of what makes an mRNA edition an mRNA edition. Within these pages you will find some new types of articles: opinion-editorials and what ifs, while seeing some familiar themes return, perhaps in the form of a random excerpt from a peer, or a silly quiz, the stuff of mRNA legends. The influence of old mRNA is clear in our edition, but how have legends and mythology affected us in the modern era? How do they affect the world of science?

That is what we will zoom into for this edition. Within these pages you might read about the historical origins of the term "chimera", or what kinds of beliefs have replaced the myths of old. All of this and more, we proudly bring to you in the first edition of this academic year. I hope you enjoy reading this mRNA as much as we enjoyed writing it!

At your service,

Annemieke Mathissen
Editor-in-Chief of mRNA 5.5

FROM THE BOARD

TOM DE LAAT

Dear members,

While writing this, it was just announced that we would go back into a new lockdown. Of course, by the time this mRNA arrives on your doorstep, this might have all changed. Regardless of the current situation, I hope you are doing well in these weird times.

Since the start of this academic year, we have been able to enjoy some awesome activities. To start with, there was a wonderful IntroN weekend here in Delft and a picnic in the first week. Eventually, we also hosted a physical symposium and of course drinks in Bar het Lab. Naturally, the hopes of a Dies party in the Steck grew larger and larger. But Covid-19 swung back again, and a physical Dies party eluded us once more. Recent additions to our study might find that celebrating Hooke's birthday in the Steck is more of a myth than a memory. Our association lives on, however. Obviously, we are looking forward to many more awesome events, such as the gala and the Wnt trip to Gran Canaria. Dies parties may even be held again once more, no matter how mythical they may seem.



In this mRNA, you will read a lot about mythology.

That is why I thought it is only fitting for me to share my favourite myth. You may find it cliché, but my favourite myth is the Trojan War. I could ramble on about every single detail in this epic, but you all probably know the story. What fascinates me the most about it though, is that for the longest amount of time, we thought that the Trojan war never happened and that Troy never existed. More recently, however, the general consensus is that there actually was a war between the Greeks and the Trojans and that Homer's story, although fictionalised, told the truth. Troy was actually excavated already, some time ago. This goes to show that no matter how mythical something (like a Dies party) may seem, it might have been real all along.

I hope you enjoy reading about myths in this wonderful edition of the mRNA as much as I did.

I have spoken,

Tom de Laat
President of S.V.N.B. Hooke 2021-2022

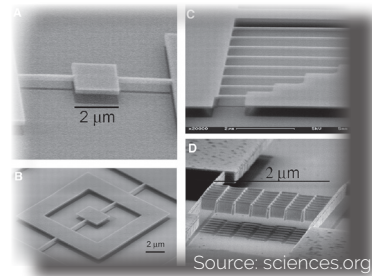
HIGH RESOLUTION MASS SENSING

NANONEWS

The nanoscale mass sensor is a new tool which will improve the accuracy of mass sensing. Until now, the only good sensors were Micro-ElectroMechanical Systems (MEMS). The Nano-ElectroMechanical Systems (NEMS) were very expensive and complex, as they required many intricate production steps.

However, a new way to produce them could change it all: 3D printing! This new technique combines speedy fabrication with an effective alternative to semiconducting resonators for mass and force sensors.

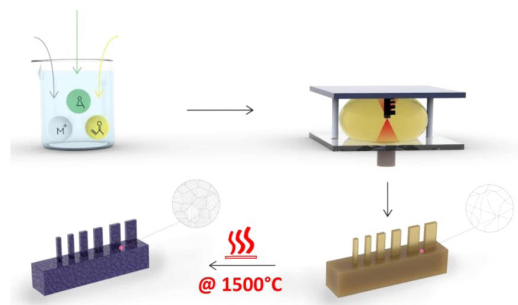
The 3D printing begins with a specially made precursor ink, which is heated to 1500°C to turn the structure rigid and also removes all the organic contents that could have been in the solution or just contaminated as the process goes. The printed devices are made out of ceramic, which has a high Young's modulus and low damping coefficient and has shown to outperform silicone-based NEMS. The rigidity change leads to shrinkage, so in theory, it is possible to view features of the size of tens of nanometres. However, this size reduction could also result in the deformation of the final structure. Especially with circular membranes, because of the stress induced in the membranes during the thermal step of the production. These deformations could be suppressed by printing the devices on guiding lines or domes.



Thus, the 3D printing of NEMS is a breakthrough for super low mass and force sensing. As they can be fabricated with a simple and versatile system, they could be used for fabricating small numbers of NEMS devices or an evaluation for a possible mass serial production.

It also allows the creation of specific functionalities by tailoring the solutions used in the beginning of the creating processes, leading to new types of nanomechanical devices. For example, a certain material, Nd:YAG, is an optical emitter at 1064 nanometres and could be the basis of an integrated optomechanical device like a tiny microscope.

This exciting new process could lead to an improved resolution of the sensors in our phones and other everyday appliances, as they could be now produced at a much larger scale.



MYTHOLOGY STORIES

MYTHOLOGY

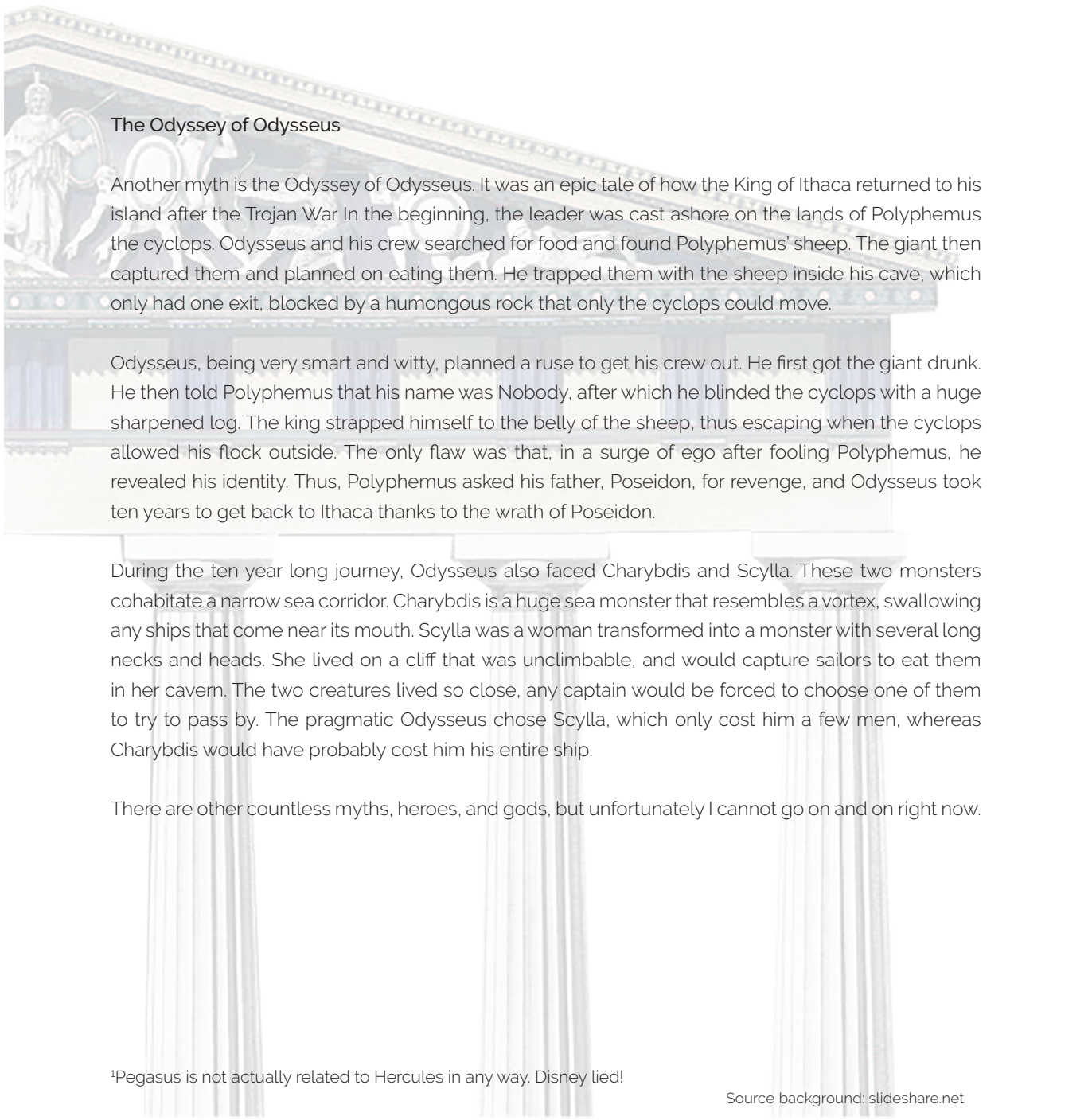
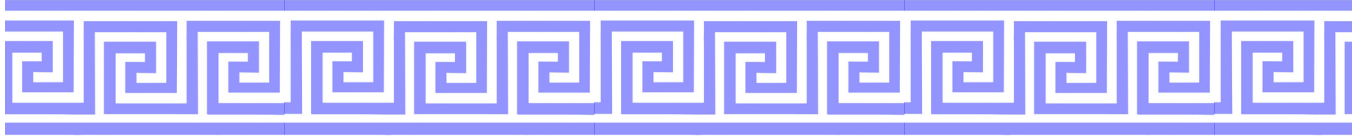
Around the world and throughout the ages, many different mythologies have existed. You have probably heard of some of them like those perpetuated by the Norse, Romans, Egyptians, or Greeks. These civilisations relied on myths and stories to make sense of the universe and to morally educate people, passing them down from generation to generation.

Mythologies are so diverse, it would be impossible to discuss them all here, so the focus today is to introduce you all to Greek mythology. There are many versions, but the general stories stay unchanged. For your understanding of later articles, here are two myths.

Bellerophon, Pegasus, and the Chimera

The Greek hero and demigod Bellerophon is the son of Poseidon, the Ocean God, and a human woman, and is most known for two epic adventures. First, he tamed the winged horse Pegasus¹ and later, he battled against the Chimera. Bellerophon grew up in Corinth, without knowing about his bloodline. His divine father gifted him with Pegasus, (technically) his half-brother. It sounds crazy, but this is Greek mythology. Pegasus was born of the beheading of the gorgon Medusa - *that* Medusa, of turning people into stone. Before she was a monster, she used to be a beautiful woman. She had a 'fling' with Poseidon in the temple of Athena, the goddess turned the maiden into a serpentine monster out of disrespect. It became the hero Perseus' task to kill her; using his shield as a mirror to never cross her stony stare, he beheaded her, accomplishing his mission. That is how Pegasus came to be, out of Medusa's severed head.

The winged horse was a wild animal and supposedly untameable until Bellerophon was able to put a golden bridle on the horse with the help of the wise goddess Athena. Having a flying horse became a great advantage when going into battle against the Chimera. It was a fire breathing creature, but unlike a dragon, the beast had a lion's body, a snake as a tail, and a goat head which could spit fire on its back, making it unapproachable. Bellerophon managed to fly above the Chimera, out of distance from the fire while shooting arrows at the monster, greatly weakening the creature. In a final attack, the Greek hero attached a lump of metal at the end of his spear, which he threw at the Chimera's goat head. The fiery breath of the creature melted the metal in an act of defense, but it led to the liquid pouring down its throat and then solidifying in the beast's organs, ultimately killing the monster.



The Odyssey of Odysseus

Another myth is the Odyssey of Odysseus. It was an epic tale of how the King of Ithaca returned to his island after the Trojan War. In the beginning, the leader was cast ashore on the lands of Polyphemus the cyclops. Odysseus and his crew searched for food and found Polyphemus' sheep. The giant then captured them and planned on eating them. He trapped them with the sheep inside his cave, which only had one exit, blocked by a humongous rock that only the cyclops could move.

Odysseus, being very smart and witty, planned a ruse to get his crew out. He first got the giant drunk. He then told Polyphemus that his name was Nobody, after which he blinded the cyclops with a huge sharpened log. The king strapped himself to the belly of the sheep, thus escaping when the cyclops allowed his flock outside. The only flaw was that, in a surge of ego after fooling Polyphemus, he revealed his identity. Thus, Polyphemus asked his father, Poseidon, for revenge, and Odysseus took ten years to get back to Ithaca thanks to the wrath of Poseidon.

During the ten year long journey, Odysseus also faced Charybdis and Scylla. These two monsters cohabitate a narrow sea corridor. Charybdis is a huge sea monster that resembles a vortex, swallowing any ships that come near its mouth. Scylla was a woman transformed into a monster with several long necks and heads. She lived on a cliff that was unclimbable, and would capture sailors to eat them in her cavern. The two creatures lived so close, any captain would be forced to choose one of them to try to pass by. The pragmatic Odysseus chose Scylla, which only cost him a few men, whereas Charybdis would have probably cost him his entire ship.

There are other countless myths, heroes, and gods, but unfortunately I cannot go on and on right now.

¹Pegasus is not actually related to Hercules in any way. Disney lied!

Source background: slideshare.net

MRNA x BOOKE CLUB

BOOK RECOMMENDATIONS

As you can probably tell, we at mRNA love to read, especially when it comes to mythology (and science fiction). To nurture and spread this love of reading, we decided to team up with Hooke's Booke Club to give you some recommendations to get you through this winter.

Flowers for Algernon - Daniel Keyes

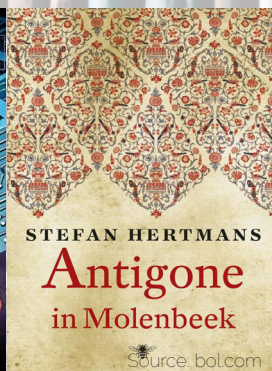
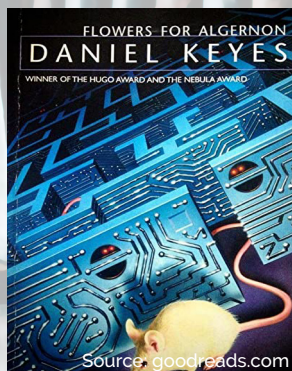
Written in the first person, *Flowers for Algernon* brilliantly displays the world through the eyes of its mentally disabled protagonist, Charlie Gordon. The novel follows his experiences after an operation which enhances his intelligence, guiding the reader through Charlie's changing world views and new understandings using his own written progress reports. Through this emotional, funny, and well-written story Daniel Keyes shows that sometimes, ignorance is indeed bliss.

Antigone in Molenbeek - Stefan Hertmans

In this short novel from 2017, Stefan Hertmans projects the ancient Greek tragedy of the myth of Antigone, the daughter of Oedipus, onto our modern era. The book follows Nouria, a law student in Brussels, in her battle to recover the body of her terrorist brother to give him a proper burial. This book is only 88 pages long but might be a bit uneasy for some to read, since it is in Dutch. Nonetheless, it is a touching and impressive book, where a young law student is ironically in an ethical conflict with the laws imposed on her by society.

Dune - Frank Herbert

With Denis Villeneuve's new adaptation turning out to be a visual delight, what better excuse could you have to revisit Frank Herbert's 1965 classic, *Dune*? This inspiration behind so many other science fiction classics still holds up today; betrayal, intrigue, prophecy, and hidden abilities all blend together in this galactic coming-of-age tale. Herbert's dialogue remains evergreen and sharp, gripping you with its wit as you peer into the conflicting emotions of Paul Atreides once he realises what must be done in his name.



MICROSCOPIC RECORD HOLDERS

NANOLYMPICS

For the Olympic Games in 2012, a tiny version of the Olympic symbol was created. British chemists made a molecule 1.2 nanometres wide, consisting of 19 carbon atoms and 12 hydrogen atoms. Would it be possible to make a protein-nano-lympics though? Well, comparing proteins is very difficult to do but nonetheless, here are some extreme proteins that would certainly win a medal in some categories.

The fastest: dynein

There are many different molecular motors. After evolving for millions of years, some have reached astounding velocities for their structure. Dynein is the fastest molecular motor, clocking in at a blistering 14 micrometres a second. Though this does not sound like much, this protein is only a few hundred nanometres in size; it darts around at about 100 times its own size per second. Can you imagine a person walking at 200 metres a second?

The largest: titin

Titin is a protein that is abundant in the human body, responsible for muscle's elasticity. The protein consists of a whopping 244 protein domains folded together and has some interesting dynamics. Under tension, these domains are unfolded so the protein stretches. When the tension is removed, titin relaxes by refolding these protein domains. Since titin is heavy and very abundant, every adult has approximately half a kilogram worth of titin in their body.

Titin is what is called a giant protein, as it is well over 1 micrometre in size. It is the largest known protein, with the largest number of exons in its gene (TTN) as well as the longest exon within the gene. Another thing that makes titin so interesting is its clinical relevance. Mutations lead to hereditary myopathy, for example, because its role in the muscular system is so important.

The smallest: TRP

If there is a largest protein, then we must also have a smallest: the tryptophan cage, or TRP cage. This protein is found in the saliva of Gila monsters. You may wonder what this animal is, because it sounds like a nano version of the Loch Ness Monster or the Yeti, but I assure you, the Gila monster is very real.

With its 20 amino acids, the TRP cage is the smallest protein known. It is about 7 nanometres in size, so dynein can step over it in a single step (in less than 1 millisecond). Even though it is small, there is one alpha helix in its structure. Besides its size, the TRP cage holds another record: it folds in only 4 microseconds. This protein can be analysed to learn more about how proteins should fold properly, and therefore help us understand complex diseases.

Dodson, B, 2012, Olympicene - a nano-size tribute to sports and science, New Atlas, <<https://newatlas.com/olympicene-molecule-synthesis-imaging/22981/>>

Bhaabha, G., Johnson, G.T., Schroeder, C.M., & Vale, R.D. 2015, How Dynein Moves Along Microtubules, Trends in Biochemical Sciences, <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4706479/>>

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THE RIGHT TO REPAIR

OP-ED

Have you ever tried to repair a broken phone? It is a very rewarding process; breathing new life into what is probably your most used piece of tech, avoiding the hassle of transferring all your data and learning the quirks of a new device, all while saving yourself some money and your phone from the landfill. If you have done this before, you will know the exact feeling I am talking about, but sadly, thanks to years of anti-repair design practices, policies, and the serialisation of parts, experiencing it will probably only get more difficult.

Take the latest iPhone for example: opening the device up is already a pain, requiring you to remove a slew of different screw types before reaching anything you may want to replace. Once you get in, the real frustration begins:



how are you going to get your hands onto a replacement part? Apple will not sell you any. Their manufacturing and recycling partners will not either; they cannot, thanks to their contracts with Apple. Your best bet is buying another broken iPhone

and transplanting working components, but even this will not be enough. Replacing almost any part of the phone means compromising features or functionality and gives you a warning that the parts are non-genuine Apple parts, even if you directly transplanted them not five minutes ago. Replacing the screen means losing Face ID, True Tone, and auto brightness control. If your

battery is getting worn out, replacing it means losing battery health and performance options. Of course, there is a solution to this: go to Apple, or one of their repair partners, and they can use a proprietary tool to remove all these arbitrary locks and make the phone whole again. This is the only way; a solution only they can provide, to a problem they create.

To be clear, this is not an Apple-only problem; while they helped pave the way, other manufacturers have followed in their footsteps, and *unrepairability* is now the standard for most consumer electronics, and, unfortunately, a lot of critical medical equipment. Not even hospitals have access to spare parts, schematics, or manuals for much of their equipment. This is an issue only compounded by the pandemic, as equipment previously sitting in storage was unretired for use.

A serialised part locking you out of some features on your phone is a pain, but a similar lock on medical equipment can be far worse.

In a survey of 129 hospital repair technicians across the U.S., conducted by the U.S. Public Interest Research Group in December 2020, 76% had been denied access to parts or service materials for critical medical equipment by the manufacturer over the last three months; 80% at the time had equipment that could not be serviced due to restrictions on service keys, parts, or other materials; 97% agreed that removing barriers to parts and service materials was important to their repair work. The situation is more urgent in poorer parts of the world; while hospitals in the U.S. and Europe not having access to the parts and schematics they need is an issue, they can at least rely on the manufacturer sending someone, eventually. Some regions do not have this luxury, and no access to spare parts or documentation means any equipment that breaks stays broken, lowering the access to quality care.

The Right to Repair movement aims to remedy these situations. Imagine being inspired to buy a microscope by the microscopy course: you should have the right to use it, modify it, and repair it as you wish. No arbitrary locks limiting your right to any of these things should exist.



Source: Pixnio

If Nanobiology gave you the skills to fix it, you should be free to try, or to take it to a technician of your choice, rather than being forced to take it back to a manufacturer that wants to double-dip.

Despite all the doom and gloom about owning nothing and being happy, Right to Repair is gaining ground in both the U.S. and EU: a Federal Trade Commission report on the matter found "scant evidence to support manufacturers' justifications for repair restrictions", and new EU regulations from 2020 demand that manufacturers must make spare parts and repair documentation for some consumer electronics available for seven to ten years. These are all steps in the right direction, but not complete solutions. Since poor access to repair is a problem that harms the environment as well as our rights, wallets, and access to healthcare, a full solution is a necessity.

If you want to help, you can find more about Right to Repair and how to support Right to Repair advocacy in your region via the internet.

Source background: Pixnio

GOING BEHIND THE MYTH

MYTHOLOGY

As described earlier, the Chimera was not the nicest animal to have as a pet. Any creature with a fire-breathing goat head is a force to be reckoned with. Adding the other dangerous parts like the lion and the snake only made it more terrifying.

Today, the term "chimera" is mostly used when referring to research into the mixing of multiple organisms. Nowadays, a chimera refers to a living organism containing at least two different sets of genetic material. Surprisingly, some (ex-)twins are chimeras: in some fraternal twins, one embryo dies very early and gets partially absorbed by the surviving embryo, which subsequently contains cells with both genotypes. In the scientific world, many other examples can be found, from macaque monkey embryos containing human pluripotent stem cells, to mice living life to the fullest with a rat pancreas.

This is the foundation of xenotransplantation; animals growing human organs for later transplantation. Thus far, this practice has been mostly performed by injecting human pluripotent stem cells into an animal blastocyst. CRISPR is used in this technique to cut away the specific genes encoding the organism's natural organs. In the scientific world, this is a new and exciting field. Host rejection is one of the most common dangers of organ transplant. If this method were to succeed in producing functioning donor organs, the risk of organ rejection would plummet, because the organs would already contain the recipient's DNA.

The latest development regarding these revolutionary organ donor discoveries is the transplantation of a pig kidney into a living, but braindead, human patient. The rejection was prevented by altering parts of the pig's DNA encoding alpha-gal transferase, which normally gets targeted by human antibodies. Another measure that had been taken was also transplanting the pig's thymus gland, which can help train the immune system, into the patient. Immunosuppressive drugs were still used, to be safe, but things went smoothly; the kidney immediately started filtering blood, functioning as normal. During the 54 hours the scientists observed the patient, not a single sign of rejection was registered. However, since the patient was already passing away, long-term consequences remain uncertain. Parts of the immune system, such as the T-cells, are known to react slower and recognise the organ as foreign later, consequently attacking the transplant. Incorporating the thymus is theorised to mitigate this effect, but this remains to be tested.

Practical problems still remain, but addressing these is at least a known quantity. Lesser explored questions include the ethical concerns behind this: how far can we take this until the newly formed creatures start looking too much like humans? Are the animals suffering too much to proceed? How big is the danger of introducing animal diseases to humans?

Source background: freepikpsd.com

BIOTERRORISM MYTHOLOGY

"The oldest and strongest emotion of mankind is fear, and the oldest and strongest kind of fear is fear of the unknown." - H. P. Lovecraft

Plagues are one of humanity's oldest horrors. Throughout the ages, gods of plague and disease have flickered in and out of the edges of mythology. These were beings to appease and fearfully respect, but as humanity evolved, we took up the mantle that our gods once held in using disease as a weapon of terror.

Bioterrorism is not a new occurrence. The earliest known example was in 1347, when Mongol invaders catapulted plague-infested bodies into a Genoese trade center¹. In 1763, British troops passed smallpox-infested blankets to Native Americans besieging their Fort Pitt. In World War I, Germany attempted to use glanders² to infect horses and cattle owned by allied forces. These are but a few examples, but the general trend is clear: disease can be used as a weapon of mass destruction, as an intimidation tactic, or as punishment for demands unmet, to great levels of success.

Understandably, bioterrorism was a thing to fear in the age when baths were considered "dirty", but why is bioterrorism so effective as a tool of fear, even to this day? Even though we have knowledge of our would-be microbial assailants, the problem and threat persists. As the World Health Organisation (WHO) states, the extreme difficulty of predicting biological attacks ahead of time means that public health infrastructure is often the first to detect and respond, depending upon the quality of their vigilance. This means

that there could be a significant period of time where the effects of an attack are only just appearing, but people do not know what they have, how serious it is, or how far it has spread. Thus, bioterrorism evokes a visceral fear of a silent predator moving through your own population. It is no wonder then, that in such a crisis, fingers are often pointed down the lines of old suspicions. How scared should we actually be? Where there is fear of attack, there is a protocol for prevention and management. The chance of a biological warfare attack has low likelihood, but high consequences, and the WHO has shaped their recommendations around this. Instead of a little-used bioterrorism response force, the key, they say, is having a robust public health infrastructure with quick response time, experienced members, and the resources to effectively treat victims. They have also provided us with a watchlist of eleven bacteria, viruses, and fungi. With every breakthrough in epidemiological, immunological, and pathological research, new security and detection infrastructure and innovations in treatment can be made.

Today, Apollo, Nergal, and Chalchuihtotolin are replaced by vague myths of clandestine labs, and every upstart epidemic arrives with a slew of suspicion. But hopefully sharing knowledge and scientific innovation can make a bioterrorist attack seem less like something unstoppable out of a myth, and more like something that we can combat.

¹Actually, some historians believed that when a ship from this trade center returned to mainland Italy, it could have been the ground zero of the most famous epidemic of bubonic plague, the Black Death.

²A rare bacterial disease caused by *Burkholderia mallei* that primarily affects horses, donkeys, and mules, but can be transmissible to humans.

<https://www.britannica.com/technology/biological-weapon/Biological-weapons-in-history>
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https://www.who.int/health-topics/biological-weapons#tab-tab_1

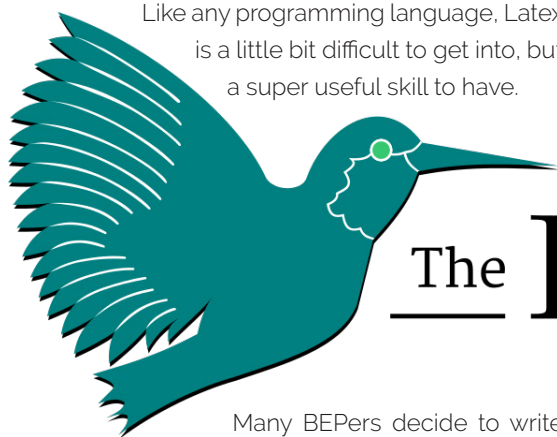
INTRO TO LATEX

TIPS & TRICKS

For those of you who have never seen Latex before (pronounced Latec), here is some handy information to get you started. For those of you that are seasoned users, you might still pick up some handy tips and tricks.

You can compare Latex to a programming language that allows you to make and edit documents in a structured way. Although there are a couple of Latex editors, one that is often used is Overleaf. Check it out at [Overleaf.com](https://overleaf.com).

Like any programming language, Latex is a little bit difficult to get into, but a super useful skill to have.



The LATEX Project

Source: latex-project.org

Many BEPers decide to write their thesis in Latex, simply because it is so much more consistent and structured than alternatives. An added bonus is that a bibliography is easy to create, so you do not have to endlessly retrace your online steps!

Templates

If you do not feel like writing something completely from scratch, you can use templates that are freely accessible. There are even some templates for homework assignments from the TU Delft. If you prefer the layout of another

document, you can easily edit that one and simply add an image of the TU logo, for example. Besides that, there are templates for CVs, reports, and much more.

Online help

Like for any other programming language, you can use Google to help out. Overleaf is very elaborate itself, explaining functions on its website. Entire forums are dedicated to specific commands, so any question that you might have can be answered online. Do check the solutions that you find online though, as Latex has existed for quite some time now, so you might run into some irrelevant or outdated information.

Structure

The beauty of Latex is that it is well organised and structured. For example, you do not have to change the size or font for titles, Latex can do this for you! Using commands like `\section{...Part1...}` and `\chapter{...Part2}`, will already give you different sizes of text, which will be structured too. There are loads and loads of other shortcuts that can make your life very easy. There is also the option to use comments, just like when programming, by using the `%`.

Fokko vander Bult Tips & Tricks

Latex really is a useful skill to have. Like any other skill, it requires practice though, so open up Google, go to Overleaf, and start writing! To help you start, here are some tips by the Latex-genius and mathematician, Fokko van de Bult. As always, listen to his wise words:

I.

“Use the design and tools incorporated in Latex. There are functions for anything you can think of, like bold text, titles, or different sizes. Use these functions instead of changing the complete format.”

II.

“Google for the win! Yes this has already been said, but repetition is key.”

III.

“Do not install all packages in the world. Try to minimise the amount so that you keep your work structured.”

Here are some recommended packages by Fokko:

amsmath

This is a nice package for mathematics or applications thereof. It includes a lot of extra (math) symbols and functions that make formulas a lot prettier, for example.

tikz

This is a package that is very powerful in prettying up images in Latex. A lot of packages or functions that have to do with images are made up of the principles in Tikz. What's more, this package includes options to work with colours.

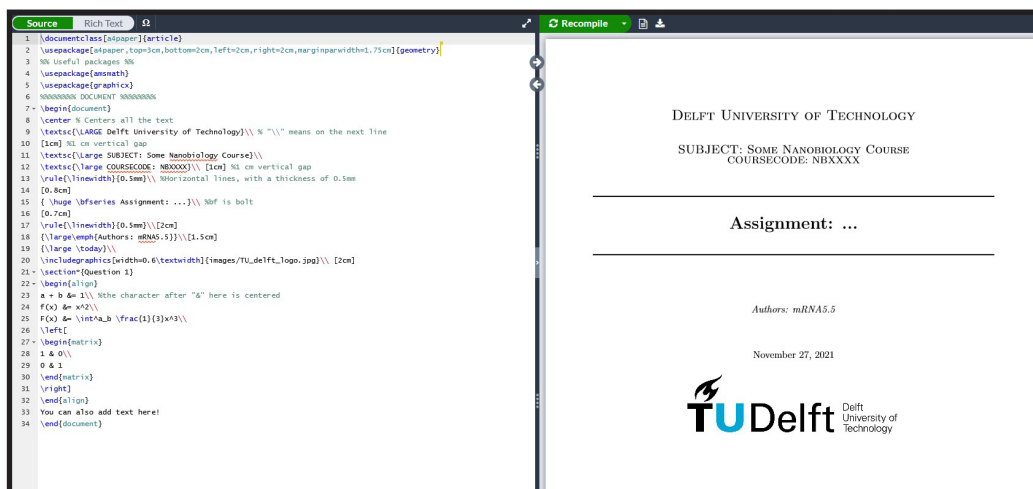
fullpage

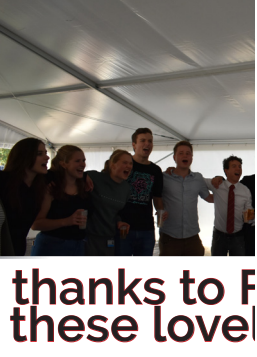
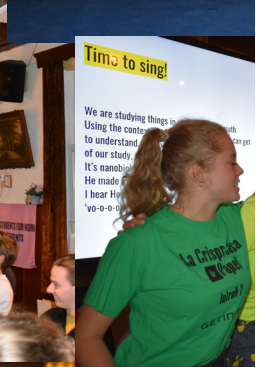
This package can make big formulas fit on one line only. If you do not use this, your pages can get messy really fast if you're working with long lines of code or equations.

multirow

This package includes a lot of options to make your tables prettier and more structured.

Below, you can see how Overleaf looks. Check out how easy and logical the code is, and see the result. Like I said before, it might be somewhat difficult to get into Latex, but it is useful in many ways. Who knows, in a week you might have a killer CV!





Huge thanks to F
for these love!



to Fotosynthesie
lovely pictures!

ALIENS: THE MODERN MYTH?

MYTHOLOGY

How long before we live in a Star Wars-like society with different races of aliens all competing against each other for galactic supremacy? The possibility of finding alien life has fascinated many for as long as humans have been on Earth, and we have all heard of at least one myth or conspiracy regarding aliens, but how likely is this? What prerequisites do planets need to fulfill before they can give rise to the next planet-colonising Wookies? How likely is it that we will meet an extraterrestrial villain, such as Emperor Palpatine, in the coming centuries?

The mysteries of the origins of life still remain mostly unsolved, but many requirements are already known. The temperature of a planet is the first hurdle; it needs to be exactly right, as we can see on our own planet, and it is relatively easy to estimate using orbital and climate models. Adequate temperatures lie somewhere in between -15°C and 122°C , a fairly wide margin. Other limitations include the presence of nitrogen in a planet's atmosphere, water on its surface, and protection from harmful UV and cosmic rays.

Even assuming a planet can successfully sustain life, giving rise to "advanced" civilisations is still no guarantee. By advanced, we mean civilisations capable of emitting and receiving signals from outer space, not just ones with names more sophisticated than Og and Grog, but even getting to this point may be incredibly unlikely. Many great filters need to be overcome; going from basic self-replicating polynucleotides to single-celled life to complex multicellular organisms

requires long-term stability with enough selection pressures to facilitate evolution, and an immense amount of luck. Determining how many planets meet these criteria is difficult; we only have ourselves as a benchmark. There could even be advanced civilisations out there which skipped developing radio technology, or maybe had it but not anymore, making estimation even more inaccurate.

All things considered, we do not know if we should expect any upcoming space invasion. However, it is likely that other planets can give birth to life, and perhaps at least one of these planets has already met our criteria for "advanced" civilisations. When this will happen or if it has already happened remains a mystery. Until then, we will just have to amuse ourselves by rewatching all the Star Wars movies.

Wokay, C.P., 2014. 'Requirements and Limits for Life in the Context of Exoplanets'. Physical Sciences. <https://www.phas.org/content/111/35/12628#T4>

HOW FAST COULD WINNIE THE POOH SWIM IN HONEY?

WHAT IF?

To answer this age-old, grizzly question, a few assumptions must be made. First, let us consider our silly old bear a sphere with radius (r) of 1 metre. Second, the average swimming speed for a 100-metre freestyle is around 1.4 metres per second, but since Pooh does not seem like a beary good swimmer let us round it to a not too embearassing 1 metre per second (v_{water}).

The bear constants we used for the viscosities are:

$$\mu_{water} = 10^{-3} Pa \cdot s, \mu_{honey} \approx 1 Pa \cdot s$$

The average power (P) that is pawssible by Winnie while swimming in water can be written up as follows (where F denotes the forces):

$$P = F_{thrust} \cdot v_{water}$$

Which is according to Stoke's Law:

$$F_{thrust} = F_{drag} = 6 \cdot \pi \cdot r \cdot \mu_{water} \cdot v_{water}$$

Since the power Winnie produces in the different media is constant:

$$\mu_{water} \cdot v_{water}^2 = \mu_{honey} \cdot v_{honey}^2$$

Solving fur the speed in honey we get an unbearably slow:

$$P = 6\pi r \mu_{water} \cdot v_{water}^2 = 6\pi r \mu_{honey} \cdot v_{honey}^2$$

$$v_{honey} = v_{water} \sqrt{\frac{\mu_{water}}{\mu_{honey}}} \approx 3 cm / s$$



Source: freepngimg.com

Remarks:

Honey is dense. Even denser than you, me, or Winnie (1.4kg/L). So, in fact Winnie would float on the honey, which makes swimming a complete pandamonium.

If we calculate Winnie's Reynolds number, we get a number close to 3. Apparently Winnie's movement can be considered laminar flow in honey which is the polar opposite to normal swimming. It means he is almost like a bacterium trying to shift through water! It acts more like a bearrier than a medium.

And as you might have noticed we put some bear-related puns in this very professional and koalative analysis. Thirteen to be exact. Can you find all of them? Or would you just rather hibearnate?

Source background: rd.com

WHICH AMINO ACID ARE YOU?

QUIZ

Which amino acid do you sympathize with most? Check the qualities on the left, and see which number corresponds to your amino acid identity!

I.

Biggest guy in school
Gives really good hugs to everyone
Likes to impersonate pirates

Methionine

Functions as a start codon
Intermediate in the biosynthesis of cysteine
Hydrophobic

II.

Always trying to make plans with you
Goes on a juice cleanse and turns into an entirely new person
Cannot swim

Serine

Often written as 'ser'
Side chain contains alcohol
Present in lots of codons

III.

Loves chai lattes
Is really into soy
If you ask them "how are you" – they will go on and on

Lysine

Basic
Can be found in your tofu
Has one of the longest side chains

IV.

In a committed relationship
Makes really good chocolate chip cookies
A bit mysterious

Phenylalanine

Frequently found with alanine
Is an aromatic compound
Its role in the body isn't understood

V.

Sees rules more as guidelines
Never drinks enough water
Has misplaced confidence, thinks they are a pro in everything

Arginine

One of the largest amino acids
Present in lots of codons
Its single letter code is 'R'

VI.

Very formal, says sir and miss
Likes to party
Social butterfly

Proline

Often written as 'pro'
Hydrophobic
Its side chain messes with its base format



GOING BEHIND THE MYTH

MYTHOLOGY

Scylla and Charybdis

The myth of Scylla and Charybdis not only has a geographical basis, but is also an example of how mythology has persisted in the world around us, even today.

The story marks a real place: the bit of sea where the monsters resided is the Strait of Messina. Separating the isle of Sicily from mainland Italy, the narrowest part of the strait is only three kilometres wide, making it difficult to navigate. On the Italian side lies a city named Scilla, which has a large cliff where Scylla was rumoured to have lived. In front of the cliff, the cape Peloro has a whirlpool which could be the logical explanation of Charybdis. The whirlpool is not, however, big enough to sink ships.

The Greek names of the two monsters have inspired multitudes of scientists, especially in biology. Plants like *liliaceae*, native throughout the Mediterranean, historically were called *Scilla maritima*, or sea onions. After changes in taxonomy, it became *Charybdis maritima*.

Scylla and Charybdis also have a place in genetics, where they are used to describe genes and their mutations. In the *Drosophila* genome, two recent genes have been named Scilla and Charybde. These genes are involved in embryonic development. They also have human counterparts involved in neurogenesis and neuronal migration, although their names are less mythological.

Our mythological monsters also appear in astronomy: an asteroid in the Great Asteroid Belt between Mars and Jupiter is called Charybdis.

Cyclopes

"In the land of the blind, the one-eyed man is king." This proverb would have been problematic amongst the cyclopes community. These frightening monsters were known for their craftsmanship, particularly in smithing. Unfortunately, humans formed the bigger part of their diet, as these sons of Poseidon ate any man foolish enough to come too close. Surprisingly, many different myths share a common message regarding the cyclopes' native home; these cyclopes could be found primarily on Sicily.

Nowadays, there is a more realistic hypothesis to explain the tales about these massive creatures, Sicily was known to host ancient elephants in earlier times. Their bones can still be found today in the hillsides and eroding cliffs of this beautiful island. The hypothesis is that the Greeks erroneously thought that the bones of elephants were in fact cyclopes remains, a theory made even more plausible by the distinctive look of the dwarf elephant skulls. Where the trunk connects to the head of the elephant is a big hole, which was probably confused for a big eye socket.

Another intriguing consideration is the fact that Etna, the active volcano on Sicily, was said to house the forges of the cyclopes. Here, they supposedly made all the weapons of the gods. In ancient Greece, some blacksmiths may also have worn an eyepatch to prevent burning sparks from getting into their eye. Clearly, these blacksmiths imitated the cyclopes while crafting!

All these inspirations show that science is still inspired and fascinated by ancient mythology.

Pisces

Today, you will be on top of the world! You can just relax and enjoy being the King/ Queen/etc that you are. Your R^2 values will be equal to 1!

Aquarius

Today would be a good day to have a new goal or dream, or re-evaluate your current ones. It will tire you to chase an unachievable dream. Perform a fourier transform on your perspectives.

Capricorn

Today, appreciate the little things. Take time to acknowledge the beauty around you, and be grateful for those moments and things. Your telomeres are still long, you are reading mRNA, life is good.

Sagittarius

Today, take the reins. Affirm yourself and it will be greatly beneficial to your future, as Saturn positions away from the Moon. Make a proposal for your lab!

Scorpio

Do not let your impulses control you, but listen to your gut today. If something feels right, it is. If you sense something is wrong, but cannot put your finger on what it is, you are right to pass it by. If you feel you pipetted the wrong volume into your eppendorf tube, you probably did.

Libra

Watch your finances. Do not make big financial decisions today. Be serious, and without answering your every want. Just reflect and focus on your needs. Make sure you paid all your tikkies!



SCOPES

Aries

As a fire sign, you will need to keep your fiery temper in check. You need to advocate for yourself, but not become aggressive, as it will be your downfall. No need to be mean to your bacteria.

Taurus

Today you are grounded and you reflect on your privileges. Do not let that great moment take you out of the present. A bit of reflection is good, but too much will imprison you. Your optical tweezers experiment will have clear results!

Gemini

Free as the wind, as the Gemini that you are, see where life takes you. You will end up in a good place! You will lose too much energy trying to fight. Let your lab results guide you, don't get stuck on a certain hypothesis.

Cancer

Today, try to be sympathetic towards other people. It will affect others very positively and may stay with them for the rest of their lives. Pet your experiment mice, they will squeak louder today.

Leo

Do not get too distracted from your objectives today. Keep your motivation in mind and use your will to stay on track. You can do it! You can get in the focused mindset by studying at TNW, and there's a bonus: free coffee at the Hub!

Libra
thout

Virgo

Stay safe today. Do not go too far out of your comfort zone, just have a relaxing time. It is important to try things, but do not overdo it. Your body and mind also need rest and calm. Just keep pipetting, no electrophoresis today!



Source background: Pexels.com

RATING STUFF ON HOW ALIVE IT IS

EXPERT OPINION

In the land of Hades the difference between what is alive and dead is dubious, to say the least. In collaboration with the Underworld, we made an analysis of five things that might be alive. Our editorial staff has decided to consult a bioinformatics expert from Johnson & Johnson, Bálint Imre. Hades also decided to send a low level servant of his called Tobias to review the matter. They both used a rating system from 0-10, where 10 means definitely alive. We summarise their results below.

Bálint's method: We will look at a fundamental question in not just natural sciences, but also philosophy: what can be considered alive? Before we try to assess how certain organisms can be considered alive or inanimate, let us try to come up with a list of characteristics a living thing is typically associated with. To come up with a score of 0-10, we will (completely arbitrarily) pick five of these characteristics, and assign a value of 2, 1, or 0 to each of them, based on whether the thing in question fulfills the criterion completely, partially, or not at all. Having assigned these characteristics, let us see how certain organisms rank.

- (1) *The ability to replicate (R)*
- (2) *The ability to grow (G)*
- (3) *The ability to react to stimuli (S)*
- (4) *The ability to maintain a higher entropic state than the environment (E)*
- (5) *The ability to have metabolic processes (M)*

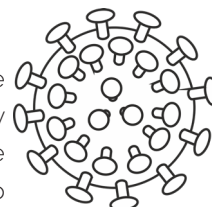
Tobias' method: I am just off my shift in the Underworld, so needless to say I am quite enthusiastic. I really do not know much about bioinfothingy... well about stuff in general but I will give it a try.

Viruses

Bálint: R:1* G:1* S:1** E:0 M:0***

Total score: 3

Tobias: Is that a thing like Covid? That's some scary stuff! Even down here, people should really watch out. I'm too scared to give it anything less than a 6.



Source: pixabay.com



Source: newtonperimetersquare.tumblr.com

Memes

Bálint: R:2 G:1 S:0 E:0 M:0

Total score: 3

Tobias: Oh, how I hate them! They do not even have legs, so 0.

C3-PO

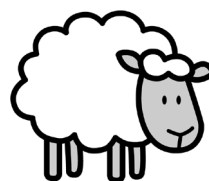
Bálint: R:0 G:0 S:2 E:2 M:2

Total score: 6

Tobias: Good movie, haven't seen it though, so I will give it a 3.



Source: easydrawingguides.com



Source: nicepng.com

Dolly

Bálint: R:2**** G:2 S:2 E:2 M:2

Total score: 10

Tobias: Cute. I like her. She deserves full points just for that, so 10.

Prions

Bálint: R:2 G:0 S:0 E:0 M:0 Total score: 2

Tobias: Is that like Mad Cow Disease? We don't get many mad cows down here. If we do, they're like breakfast for Cerberus. I give this a 1.

*A virus needs host cells to grow and reproduce.

**A virus can detect host cells, but does not have phototaxis, chemotaxis, or other forms of locomotion.

***Viruses do not actively maintain their metabolic processes.

****Dolly had six lambs as offspring.

FOLLOW A FIRST YEAR

INTERVIEW

We spoke to Melis Akgüngör, a first year Nanobiology student from Turkey. She talked to us about her experiences studying abroad and her thoughts on Nanobiology so far.

To begin with, tell us a little about yourself:

I'm from Turkey. Adapting to a new country by myself was a bit hard at the start, but now I'm used to it, so it's been great. I love music and doing sport, but can't right now because of my studies. I'm still adapting to the heavy schedule.

How are you finding the study so far?

I wanted to study Nanobiology because I didn't want to let go of physics and maths. I'm really enjoying the study; it's really good, it's worth it in my opinion. Nanobiology was a perfect, perfect course for me, and I'm really glad I chose it. I think Genetics is going well and I'm looking forward to starting Physics 1A.

What do you think of the Netherlands?

The Netherlands, it's a really free and friendly country. The people are really polite, they're really welcoming. My neighbours go out on the balcony and say hi; we don't even know each other, but they're really friendly. The only struggle I had was being seventeen when I got here, so it was a bit like *"Hey, you're an adult now. You're on your own"*. The taxes, the rent, the bills, everything was my responsibility. I struggled a bit with that, but apart from that, the Netherlands is great. I live in Rotterdam; it reminds me of Istanbul, with its skyscrapers and buildings. It gives the big city

vibes and it's really easy to find things here: there are three supermarkets in my neighborhood alone. I love it; I was in survival mode in Turkey, but when I'm here, I feel like I'm in creative mode.

Have you had any troubles with the language so far?

Yes; the letters from the municipality are all in Dutch, and Google Translate struggles sometimes, but everyone knows English here.

What about the food?

I love pannenkoeken; I make them every morning. I also recently learned how to properly eat stroopwafels: you have to heat them with your cup. I also want to try bitterballen. Hagelslag, however, was very surprising: it's just chocolate sprinkles! People eat this for breakfast. No offence, but what is that!



Source: kidsworldfun.com

Source: pinclipart.com

Source (background)
Youtube: Easy Drawing 24

NANOTALES MYTHOLOGY

There once was a lonely cell named Asterion,
He was born a warped little cell, with too much brawn,
To punish the father, to see his foster son's decay,
The lab worker synthesised him in this ill-fated way.
The home he so loathed, it cost his mind dearly,
A maze of a petri dish, he could navigate just merely.
Though at times he had visitors (but only a dozen),
They came every nine years - his home was not so buzzin'.
In his dark, cold dish, he thought in his mind,
"How foolish I am, that I behave so unkind"
As time went by he would get irate and daring,
When other scared cells came he was uncaring.
Dead cells piled up endlessly in many large heaps,
Until a heroic imprisoned phage, to this dish he leaps,
Slayed the real victim Asterion right at the acme¹,
And thanked his saviour, the beautiful Ariadne.

¹ climax

One round protein floated in saturated solution,
Fearing lysosomes approaching like a vicious pollution,
"Our end is nigh!" yelled the amino acids within,
"Who would come to our rescue, and from which kin?"
Suddenly molecules appeared on the distant horizon,
Fresh reinforcements, strong and far from wizen².
They surrounded the protein from nearly all sides,
A solvation shell they created to turn these tides.
They started hatching a plan, debated for hours,
"This war is no joke, it is no place for cowards!"
They started hydrodynamics, to stir up the solvent.
It needed much energy and a lot of involvement.
When they survived the molecules looked all around,
They were all equal, playing on fair ground.
Their leader vibrated and told all in the fable,
You are all my knights now, around this round table.

² wrinkled with age

RANDI

SÁRA BÁNOVSKÁ

```
>> rng ('shuffle');
```

```
>> randi(nr_leden)
```

```
ans=510 %Sára Bánovská
```

Hello there, fellow Nanobios!

My name is Sára Bánovská. I am currently a second year student and the president of an all-new committee - Conjugacie. In this article, I would like to touch upon a topic that is very dear to me, and it is that of mental health.

Confirming my enrolment to Nanobiology, I envisaged myself taking care of my own apartment, cycling to the university every morning, having fruitful discussions with my new friends, and being completely immersed in the lectures. And oh boy/girl, was I wrong! For starters, lectures were online, and my apartment was not really adapted to that. I lacked some prerequisite knowledge, which made homework quite laborious. And taking care of myself - less fun than I anticipated.

Soon enough the first test results came in, and despite putting in all my effort, they were nothing close to what I imagined. These struggles had a rather snowballing effect and my days would become somber. Instead of trying to look into the problem, I was ignoring it and kept repeating what I did before. Over time, I would accept this gloominess as my personality trait.

It wouldn't be until recently, I realised, that this does not need to be the case. That every day isn't supposed to be a struggle, and that I am not allowing myself to enjoy this unique chance I have. Yes, university is demanding and it is enormously pressuring, but in the end, I was the one assigning weights to my priorities.

I really want this to be the main take-home message from my story - first year has its obstacles, and of course,

studies come first. However, they need to be in symbiosis with other aspects of one's life. You have the right to relax, have fun, or do sports even though you are not on track with every course. You have all the power to make these decisions and every day doesn't have to feel like a struggle. If you need somebody to help you find this balance, please reach out for help, you don't have to bear this burden all by yourself.

Take care!

-Sára

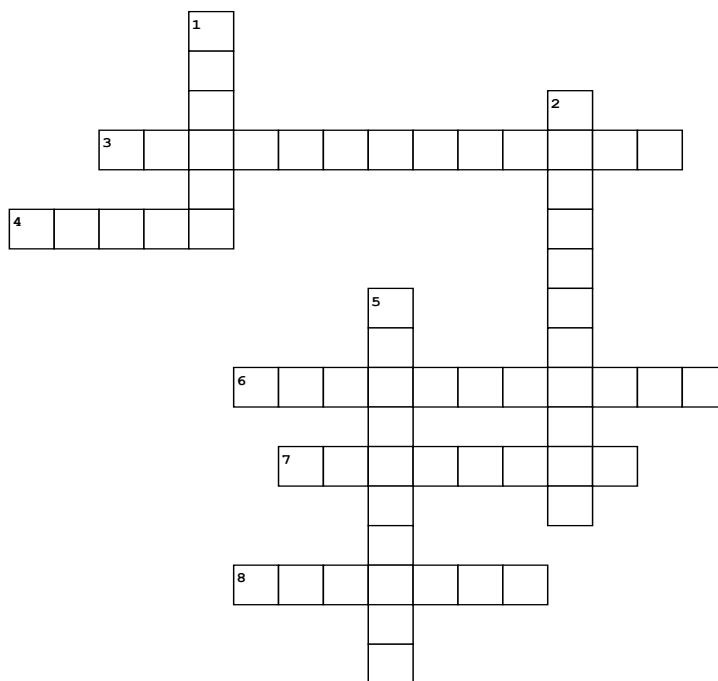


For resources and informations on mental health, scan this QR code



CROSSWORD PUZZLE

HOW WELL DID YOU READ?



Across

3. Entities that do not provide spare parts or repair documents
4. Great to swim in, especially if you are Winnie the Pooh
6. Limiting a planet's ability to sustain life, also way too low last month
7. Gift of the British to their Native American besiegers
8. Mythological Sicilian dwarf elephant lookalike, also an outstanding smith

Down

1. First organ transplanted from pig into man
2. One of the criteria to determine if something is alive
5. Secondary structure that can be found in the smallest protein

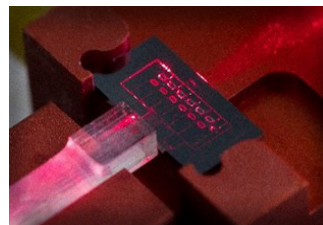


EnzyTag is a biotech company located in Nuth, which focusses on the development and optimization of synthesis routes for peptide-based new chemical entities (NCEs) and bioconjugates using the peptiligase platform. The use of chemo-enzymatic ligation strategies allows a broad scope of interesting targets varying from small cyclic peptides to medium sized proteins (<150 AA). Beside client based

projects, the company also invests in projects that broaden the application scope for the peptiligase technology. The EnzyTag R&D team consist out of a passionate group of young scientist, which are happy to welcome motivated students for internships. For more questions please visit our website www.enzytag.com or send an e-mail to svanderbeelen@enzytag.com.

THE FUTURE OF DIAGNOSTICS

The Covid-19 pandemic has made it clear that there is a need to have fast and reliable diagnostic tests available in point-of-care (PoC) surroundings. Well-known tests, like the glucose test for diabetes patients, and the pregnancy test are on the market for decades already.



Many other diagnostic tests are still complex, and have to be performed by trained staff on large equipment in specialized facilities. Another setback is that scaling up production of tests, when there is an urgent need for large numbers, is cumbersome and time-consuming, like has been seen during the aforementioned pandemic.

In the last decade, new biosensor technologies have emerged that allow the sensitive and quantitative detection of biomarkers (indicator molecules, e.g. specific proteins or DNA) for conditions like cancer, cardiovascular and infectious diseases.

Surfix Diagnostics works on one of those new biosensor technologies, the photonic biosensor.

Small Footprint Spectrophotometers



Compact Systems for Teaching Labs and More

FLAME-CHEM spectrophotometers are fully integrated systems for measuring absorbance and transmission of liquid samples in cuvettes. FLAME-CHEM is ideal for teaching labs and research facilities where users seek high performance and great flexibility in a compact, small footprint instrument.



oceaninsight.com

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Epigenomics



Immunomics



Proteomics



Metabolomics



Metagenomics



Single-cell & transcriptomics



Systems Biology



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Databases



Cloud Development



And much more



**BISC
Global**

✉ info@biscglobal.com

📍 Ghent, Amsterdam, Basel, Boston,
San Francisco, Durham

AGENDA

HOOKE AGENDA



Board information drinks	15 December
Committee activity	16 December
YER time management workshop	20 December
Christmas drinks	21 December
Committee night	23 December
Wnt	29 January - 4 February
Company in house visit day	18 February
Interfacultary Beerpong Tournament	21 February
GMA 3	24 February

For 3rd years and up: if you want to keep receiving the mRNA, scan the QR code



Sources background: britannica.com (Poseidon, Artemis, Aphrodite) pinterest.com (Hermes, Hephaestus, Hades, Zeus) aongking.com (Dionysus) wikipedia.org (Ares and Hera) Made-in-Chine.com (Athena) theoi.com (Appollo)

