mRNA

YEAR 5 // ISSUE 1 DECEMBER 2019

INTERVIEW DIMPHNA MEIJER // REVOLUTIONARY SCIENTISTS // SCIENCE MORES
IN VITRO MEAT // POSTCARDS // S.O.S. RECIPE // CULTURES WITHIN NANOBIOLOGY

Source (also source cover): KB | Nationale Bibliotheek

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COLOPHON

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December 2019
Year 5. Issue 1.
Print run: 520.
A PDF version will be published on the mRNA page on the S.V.N.B. Hooke website:
hooke.tudelft.nl

EDITORIAL

LULU NOTSCHAELE

Dear reader,

As the days grow shorter, the weather gets colder, and you find yourself cycling to an early lecture at what looks to be the middle of the night, it becomes clear: winter is upon us. For centuries upon centuries, people have tried to find ways to brighten this dark period, adding to the traditions that make up the festive season as we know it today. Fireplaces are lit, hot chocolate is drunk, and in a few weeks you might just be lucky enough to spot Santa Claus being pulled across the night sky by his flying reindeer.

Sharing the same traditions can make us feel closer to each other. They provide us with great events to look forward to, and prescribe rules that save us the effort of having to think about day-to-day tasks. Traditions can be good, but like most things they have a flipside. It can be very easy to let yourself get stuck in a routine; to stop thinking about why you are actually doing things in a certain way, and if that way is the right one.

In this edition we invite you to join us as we delve deeper into this interesting concept. We will take a look at scientists who broke past traditions; ways in which our current traditions are being challenged, how these came to be in the first place, and much more. We decided to honour the mRNA traditions by reintroducing some recurring articles like mRNA reviews, mRqNA, and Alumnus Columnus, but we also added new ones. In this edition you will find postcards to send this holiday season, and a recipe provided by Hooke's very own S.O.S. committee!

As mRNA does, we have mutated again, very drastically this time. As I say goodbye to Roos, Simon, Ruben, Anouck, Lukas, and Sara, I welcome our newest members: Mart, Stefan, Aisha, Georgiana, and the two Julias!

I hope you enjoy reading this edition as much as we did making it,
Happy Holidays!

Lulu Notschaele
Editor-in-chief of mRNA 4.5

FROM THE BOARD
ANNA HARTENDORP

Dear reader of this beautiful mRNA,

Traditions, we have plenty of them here in the Netherlands: celebrating Kingsday, eating herring, bitterballen, oliebollen, or stroopwafels; and (in some parts) celebrating carnaval. On a smaller scale, we also have traditions in the student culture within S.V.N.B. Hooke. The Nanobiology-appropriate committee names, the vla-race during IntroN, and we cannot forget our beloved Zwethscursion.

Looking back at the events we already enjoyed this academic year, we can see quite some traditions among them. We enjoyed IntroN in August, the DIES week in November, and several informative activities spread out over the course of the last few months. Besides that, we had some firsts: we enjoyed the opening of our very first lustrum (!), the freshmen received a smoelenposter, and we now have two flags waving in the Wnt outside of Applied Sciences. Luckily, we also have a lot of events to look forward to!

We are now at the point where we can start to create more and more traditions for our beautiful study association. The fact that our path is not planned out for us is exciting, and gives us the opportunity to build a strong foundation for the years to come. Traditions are valuable. Using them, we are able to pass on knowledge and memories to future generations. On the other hand, traditions can also cause rigid thinking. Some events or actions are a certain way because they have always been like that. They are so-called AZGs (Altijd Zo Geweest). Looking at history, we see that breaking traditions also has its value. If Robert Hooke would have followed the existing traditions, maybe we would never have started using the term 'cell'. The combination of creativity and originality, together with the experience captured in traditions can lead to innovative ideas, and that is exactly what we need in the upcoming years for S.V.N.B. Hooke.

I hope you will enjoy reading this mRNA. The committee (as is tradition) put a lot of effort in the magazine, and it looks (as is tradition) very inspiring.

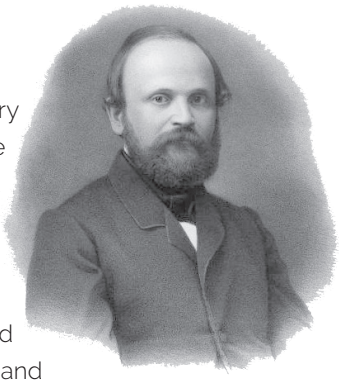
I have spoken.

Anna Hartendorp
President of S.V.N.B. Hooke 2019-2020

REVOLUTIONARY SCIENTISTS
BREAKING TRADITIONS

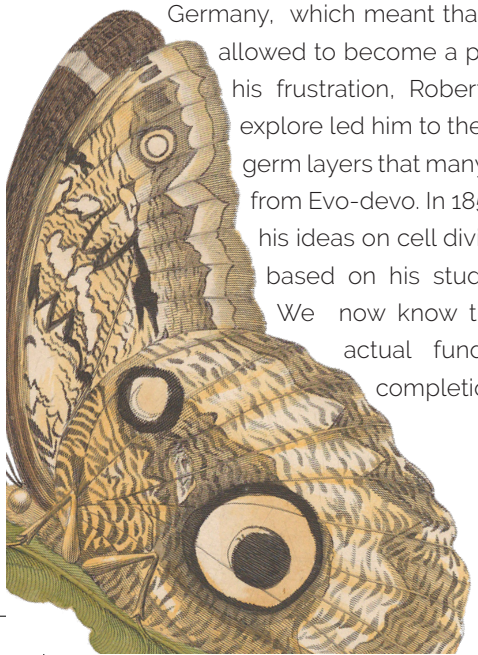
The scientific community has many norms and values that subscribe a certain way to practice science. However, some scientists took an alternative path which led to their success. Here we highlight four of these inspiring scientists.

Robert Remak



Source: nl.wikipedia.org

The cell theory may be one of the most important theories for a nanobiologist. Many scientists have contributed to this theory, and Rudolf Virchow finished the theory by the discovery that cells emerge from other cells. It is better left unsaid that Virchow 'borrowed' his ideas from Robert Remak. Remak was born in 1815 in Poland. After being homeschooled he moved to Berlin to study medicine. Robert's faith was not in his favour since Jews were not allowed to teach in Germany, which meant that Remak was not allowed to become a professor. Despite his frustration, Robert's eagerness to explore led him to the discovery of the germ layers that many of us remember from Evo-devo. In 1852 Remak shared his ideas on cell division, which were based on his study on frog eggs. We now know that this was the actual fundament for the completion of cell theory.



Maria Sibylla Merian

Some science could be considered art, but have you ever wondered whether art could be considered science? Maria Sibylla Merian's work on butterfly morphogenesis is true art. As a daughter of a printmaker, she was raised with drawing and painting. As a married woman, and mother of two, she would teach the wealthy women how to make illustrations using watercolour paint. In her free time, Maria studied the life of insects by illustrating them in their natural habitat. Her eagerness to explore led her to Amsterdam in 1691, together with her daughters. Here she studied butterflies and caterpillars by visiting cabinets. However, this left her unsatisfied because of the lack of interaction between insects and their environment. Eventually, this drove her to take the ambitious step of moving to Suriname. By going on expeditions she was able to study insectile behaviour in great detail. This is how she discovered that caterpillars have two eyes, instead of multiple ones placed along their body as Antoni van Leeuwenhoek originally claimed. After multiple years of impressive research, she returned to Amsterdam where she published her work. Her publication became a great success due to the combination of her artistic qualities and eye for detail.

Source: theconversation.com
Source butterfly: KB | Nationale Bibliotheek

Breaking Traditions

Alan Turing

Alan Turing, also known as the father of computer science and artificial intelligence, was a remarkable man. He was born in London 1912, studied mathematics at King's College in Cambridge, and went on to earn a PhD from Princeton. In this period he also published a paper called *On Computable Numbers* in which he presented the concept of the Turing machine that is now considered to be the precursor to the modern computer. In anticipation of the outbreak of World War II, Turing was recruited by the British government to undertake the secret task of breaking the Enigma ciphering system used by the Nazis. To achieve this he led his team in designing the so-called Bombe; an electromechanical machine that could find the daily key needed to decipher Nazi messages much faster than any human could. This machine allowed the allied forces to gain critical intel that would play a crucial role in winning many battles, and later the war itself. Unfortunately, he was subject to the prejudices of the society he lived in, and in 1952 Turing was charged with, in effect, being homosexual. He opted for hormone treatment over being imprisoned, and in 1954, he was found dead. The coroner's verdict was that Turing had taken his own life.

Source: nl.wikipedia.org

Source: britannica.com

Jane Goodall

Have you ever wondered if you could just skip university and go straight to your PhD? Jane Goodall would be the perfect person to talk to. At the age of eighteen Jane left England to study animal behaviour in Africa. Through a man called Dr. Leakey she got involved in the world of chimpanzees. It was her job to make contact with the chimps and to study their behaviour. After two years of study, Leakey brought Jane in contact with Cambridge University where she started her PhD in ethology. Here she was taught that science was meant to be objective and that you should not have empathy for your subjects. Jane, however, proved the opposite: because of her empathy and patience, she was able to discover how bright and intelligent chimpanzees actually are. Today Jane is travelling the world to make people aware of the footprint that we are leaving on our planet.

THE WOMAN WHO LOVES GIRAFFES

MRNA REVIEWS

For this edition mRNA decided to review a different kind of movie than usual – a documentary. The subject of our scrutiny is *The Woman who Loves Giraffes*; a film biography of Anne Innis Dagg. Follow us through the story of a pioneer in research become a women's rights activist and see how she returned to her passion after all hope seemed lost.

The documentary tells the story of 23-year-old Anne, who has a passion for giraffes. Freshly graduated, she decides to follow them to Africa to study them in the wild for the first time in history. With extracts from her letters, small reenactments, and testimonies from both Dagg herself and other people involved, the documentary manages to beautifully recreate a lifelong journey of following one's passion, even when society seems to disagree.

The music supports the story quite well, helping to get the audience invested in the story without being too present.

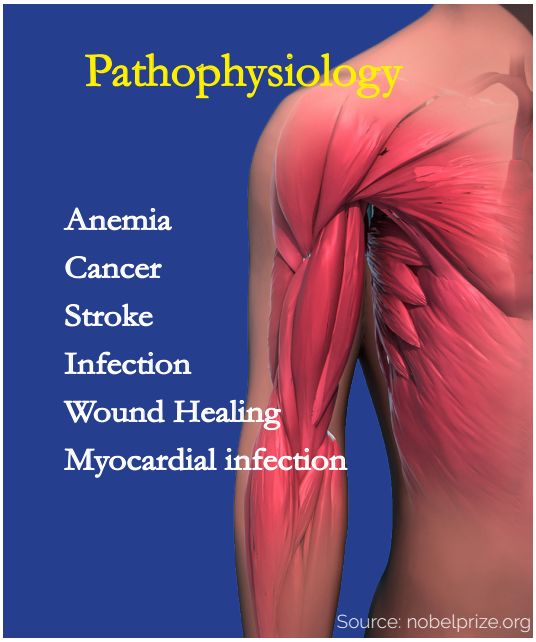
Anne Dagg wrote the book on giraffes, quite literally. Her observations and conclusions remain relevant up to this day. However, she seems to have slipped through the cracks of history. This biography reveals the reason why: even after having published 20 successful papers in renowned journals, Anne Dagg was denied tenure because she was a married woman. Without a full-time position she was forced to end her career, despite her obvious capability as a researcher. Because of this injustice, Anne dedicated 30 years of her life to activism for women's rights and published several books during this period.

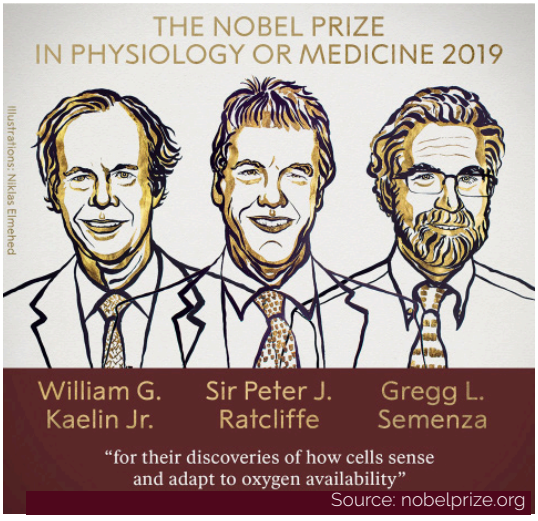
The story does have a happy ending. In 2010 top giraffeologists decided to look for her and bring her back into the fold. She has rekindled her passion for giraffes at 86 years old and is now speaking as an expert at conferences.

Source: bookshelf.ca

There is no more renowned scientific event than the awarding of The Nobel Prize. The few winners get not only a substantial amount of money, but also recognition and exposure. So why not take a look at what has happened this year, especially in the Medicine and Physiology category, during this historical event?

This year the prize was won by William G. Kaelin Jr, Sir Peter J. Ratcliffe and Gregg L. Semenza for something that at first glance might seem trivial: the mechanism of cell adaptation to hypoxia; lack of oxygen. While it is true that we have been aware of the processes taking place, the signalling mechanism that triggers e.g. increased production of red blood cells had remained elusive. Until now, that is. Through independent research, these three scientists managed to piece together the puzzle.





Activation of the mechanisms requires a dimer transcription factor of ARNT and HIF-1a. Under normal conditions, HIF-1a is degraded by the proteasome, as it is marked by the addition of hydroxyl groups. However, when oxygen is sparse, HIF-1a is not marked and, therefore, starts transcription of the necessary genes.

Now you may wonder: "Why a Nobel for such a thing?". Well, oxygen is key to complex organism survival. Oxygen levels fine-tune processes ranging from metabolism, to immune response, to blood vessel formation; basically our entire physiology. Understanding the underlying sensory mechanism can help us understand and maybe even cure a wide range of pathological conditions.

NobelPrize.org. (2019). The Nobel Prize in Physiology or Medicine 2019. [online] Available at: https://www.nobelprize.org/prizes/medicine/2019/press-release/ [Accessed 30 Oct. 2019].

DIMPHNA MEIJER: UNDERSTANDING NEURONAL SYNAPSES

INTERVIEW

This mRNA's interviewee is Dr. Dimphna Meijer! You might know her from the second year course *Physical Biology of the Cell II*, but she also has her own lab in Delft where she conducts some very interesting research. She researches the development of the central nervous system, and she has multiple projects on this subject.

Dr. Meijer started her lab here in Delft only last year. She has studied Biomedical Sciences (BSc) and experimental and Clinical Neuroscience (MSc) in Utrecht. Afterwards she carried out her PhD research in the Neurobiology Department of the Harvard Medical School and then moved back to the Netherlands to conduct her postdoctoral work at the Crystal and Structural Chemistry department at Utrecht University. For her, Delft - and especially the Department of Bionanoscience - connects the fields in which she has previously worked. The fact that the TU Delft students and researchers are more of an engineer than she is excites her and is also one of the reasons why she came to Delft; so that she can still learn.

Currently she has one bachelor student, two master students, one PhD student, and a technician working in her lab.

Could you tell us a little bit about the research you are conducting?

I have a background in neurobiology, so I am interested in how the brain works, specifically in the molecular and cellular biophysics of learning and memory. There are three research lines in my group that all converge to the main question of how neurons communicate on the nanoscale.

The first research goal is to understand macromolecular complex assembly in neuronal synapses; how do proteins work together in larger complexes to enable neurons to communicate? The building blocks for communication are partly known already and my research mainly focuses on how these building blocks work together; what are the dynamics between them and what are the forces that play a role here?

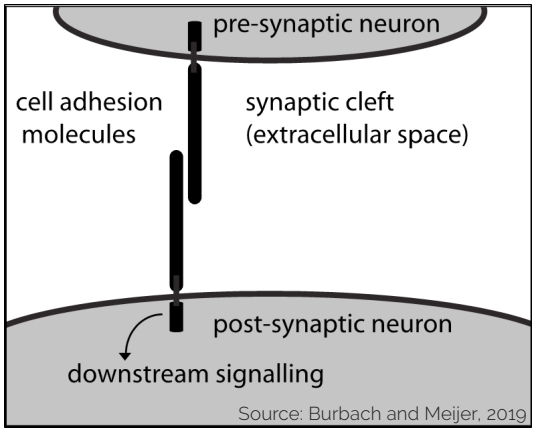
"How do proteins work together in larger complexes to enable neurons to communicate?"

That sounds very interesting, but how exactly do you research these complexes, as they have a lot of components?

We overexpress the individual building blocks, i.e. proteins, in HEK (human embryonic kidney) cells, purify them, assemble the complexes ourselves, and study them under the electron microscope. We are currently trying to purify the proteins from neurons directly as this is obviously a more relevant cell type. However, neurons are very difficult to grow, so this is challenging.

Neurons physically connect

All neurons are connected in a circuitry. We call this connection a synapse. The signal passes the synaptic cleft by chemical conversion, but the neurons are also connected physically via cell adhesion molecules. The function of this physical connection is not entirely known yet, but it might be to let the neurons find each other. It could also be that, as there is physical contact, there is also transmembrane signalling through which the neurons know that they are connected. But again; this is still very unclear.

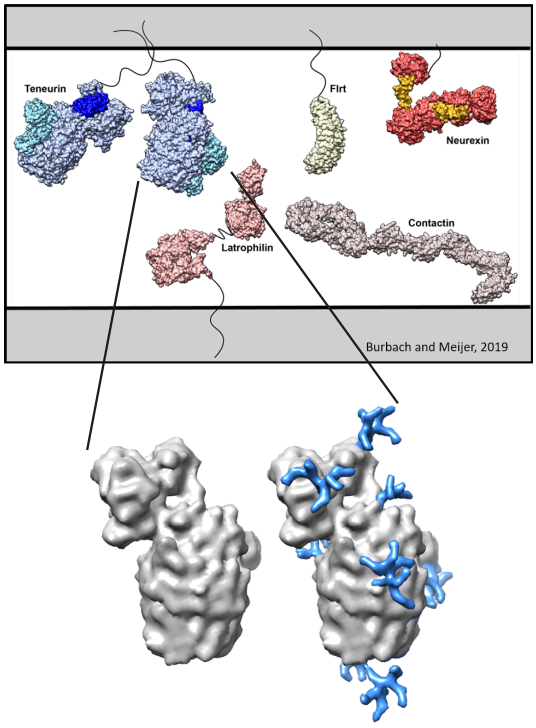


Cool! What is your second research line?

Well, neuronal transmembrane proteins are usually very heavily post-translationally modified, especially with glycans. Glycosylation is the process in which glycans, also known as carbohydrates or sugars, get attached to hydroxyl groups of specific amino acids. These can then be imagined as sugar sticks sticking out of the surfaces of these cell adhesion molecules (see image on the right). The complexity of these sugars is enormous. A particular amino acid can be 'decorated' with as many as twenty different sugars, basically resulting in twenty different protein variants. In other words: a protein sample which we previously thought would be homogeneous turned out to contain many different (glyco)variants. We are now setting up structure-function studies to research the glycosylation process in more detail.

And what is the last one?

So, as you probably know, neurons can generate action potentials; a rapid rise and fall of the membrane potential. Our third research line is more of a bottom-up approach. We are trying to reconstitute the neuronal synapse in which we can control the membrane potential.



Why did you start working in the field of science?

When I had to choose my studies, my first choice was 'Greek and Latin Language and Culture', basically because I had always received high grades in it. I realized, however, that I would then be mostly translating the past. In, for instance, biomedical sciences I would also be translating, but the unknown rather than the past. The romantic view of discovering new phenomena attracted me. Within neuroscience there are still so many things to discover, and so many open questions, that I finally chose to study neuroscience.

Do you, or other people in your lab, have certain traditions?

First of all, I think there is a difference between traditions, habits, and superstition. I, for example, always like to use the same pipette for particular work. This should not matter of course, but I think it is a sort of superstition. I think tradition is more cultural. When I was a PhD student the lab always went out for ice cream in the summer and the movies in the winter, and the PI would pay. Such traditions are not yet established in my lab since traditions need time to develop, but I will certainly enable traditions like that. For instance, last summer we went out for lunch with the students who were leaving and I would like to do the same this year.

"In, for instance, biomedical sciences I would also be translating, but the unknown rather than the past."

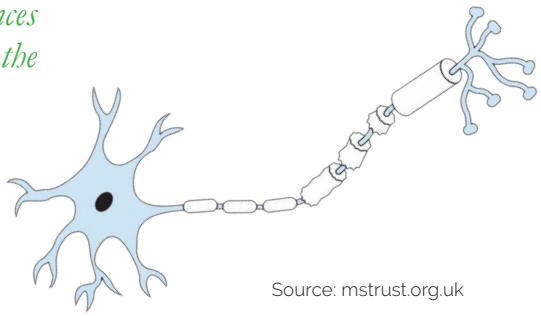
Habits can be positive or negative, do you think there is a chemical way to promote good habits and suppress bad habits?

In the first place I think it requires a strong mind to change any habits you have. In addition, you can definitely control habits or addictions chemically. I am not sure if you should want to change your habits using just chemicals. I recently read about replacing one bad habit with another, less bad, habit. This way, you might create a parallel chemical pathway that overwrites the unwanted habit.

"For me personally, I dream of engineering a neuronal synapse, which would combine all of my three current research themes."

How do you see your research field develop in the coming years?

From a broader perspective we still do not understand the molecular underpinnings of complex behaviour and emotions. In addition, there is a lot of variety on several scales. From person to person; within one brain, from area to area; and within one area, from neuron to neuron. The bridging of this enormous diversity on different scales will be a hot research topic. For me personally, I dream of engineering a neuronal synapse, which would combine all of my three current research themes.



Source: mstrust.org.uk

CULTURES WITHIN NANOBIOLOGY

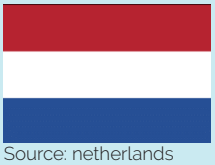
TRADITIONS

As the Nanobiology programme is now taught fully in English, the cultural variety within our association has increased greatly. Each country has its own rituals and traditions. We investigated where all the Nanobiology students come from and which traditions can be found in their home countries.

Source: wikipedia.org

Festas Juninas

At the start of June, the ending of the rain season is celebrated in Brazil. During this feast people dance the Quadrilha; a traditional dance that was introduced in the French military in the 18th century, in which two pairs would dance in a square formation. Nowadays the dance is characterized by an impressive choreography with many couples participating.



Source: netherlands -tourism.com

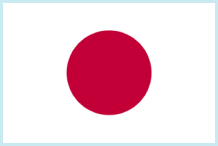
Beschuit met muisjes

To celebrate the birth of a new child, Dutch people eat biscuits with anise seeds that are covered in blue or pink sugar. How this particular combination came to be is unclear, but it is known that it all started with eating sugar bread to celebrate the successful delivery. But why do they use anise? Anise was thought to contain special healing powers that women needed during their maternity period.

Source: britannica.com

The wedding ceremony

Bread is the true sign of love at a Russian wedding. In one of their rituals the ceremony leader breaks two loaves of bread in half above the heads of the groom and bride. One half of each loaf is tied together with a ribbon and placed onto a table. The other parts of the loaves are given to the father of the bride, and the ceremony leader.



Source: wikipedia.org

Toro Nagashi

In Japan it is believed that humans originate from water. Every year people come together to light a lantern and let it float on the river, which represents the journey that souls will make before arriving in the afterlife. The feast was first held in 1946 to commemorate the lives that were lost during World War II in Japan.

Source: pinterest.com

Zellige

In Morocco famous buildings are decorated with colourful mosaic, which is called Zellige and originates from Fez. This type of artwork originated from the Hispano-moresque period, but people only started to use a brighter variation of colours in the 14th century. Only Zellige masters are said to be able to make these artworks since it requires great patience and precision.

Legend

Country where a Nano was born

Other countries

Source map: amcharts.com

PRIME EDITING AND REVIVED TOMATOES

NANONEWS II

Source: needpix.com

CRISPR Cas9 Technique 'Prime Editing'

Even though there is a lot of hype around the CRISPR Cas9 DNA editing technique, there are still many challenges that need to be overcome. Luckily, a major step in solving these challenges has been taken by D. Liu et al.

Currently programmable nucleases like CRISPR Cas9 make use of double-strand DNA breaks (DSBs) and induce a mixture of deletions and insertions. While effective, these techniques are subject to many undesired outcomes, as is the nature of DSBs. While repairing these DSBs, many mutations can occur.

D. Liu and his team developed a new technique allowing gene editing without any DSBs which thus has advantages regarding efficiency and product purity. So called 'prime editing' uses the Cas9 enzyme to target DNA using a guide RNA, which hybridizes to the target DNA site. Unlike using nucleases, prime editing incorporates new genetic information in this guide RNA molecule, to replace DNA nucleotides. Reverse Transcriptase is then used to start a number of steps to finally have the DNA repair mechanism permanently install the desired edit. The possibilities prime editing opens up are far ranging, as 89% of known pathogenic human variants could in theory be edited favourably using this technique. This number could never be reached by using techniques like base editing, nuclease editing, or Cas9 induced homology directed repair (HDR).

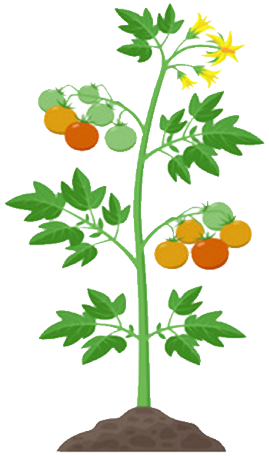
Although still in the early stage of research, prime editing sure is a promising contender for the revolutionary, all-curing medicine we are looking for.

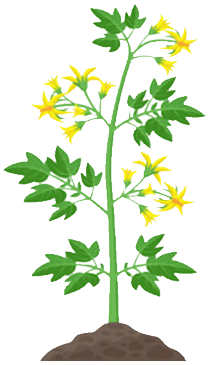
Anzalone, A., et al. (2019). Search-and-replace genome editing without double-strand breaks or donor DNA. Nature (2019).

Tomatoes revitalized

Compare a regular tomato from the mall with a tomato found on a farm in Southern Italy and a world of difference can not go unnoticed. Now, the mystery surrounding bland tasting mall tomatoes has been uncovered. A genome analysis conducted by Fei et al. shows that we owe it to ourselves that tomatoes have evolved into tasteless water containers. Compared to wildlife tomatoes, cultivated tomatoes have lost about 5000 different genes. This is probably the result of selective breeding, mainly for shelf life, yield, and biotic resistance. Aroma and flavour have proven to be more challenging to select for. One of the lost genes is the TomLoxC gene. Fei et al. have shown that TomLoxC can be associated with increased apocarotenoid levels, which are in turn positively associated with flavour and overall likeability of the tomato. With this knowledge, perhaps breeders can start selecting for TomLoxC and we can finally experience the tastiness of Italian tomatoes from the shelves of our own Albert Heijn!

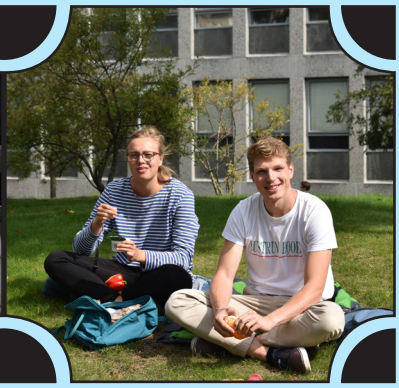
Gao, L., (2019). The tomato pan-genome uncovers new genes and a rare allele regulating fruit flavor. Nat Genet 51, 1044–1051 (2019) doi:10.1038/s41588-019-0410-2





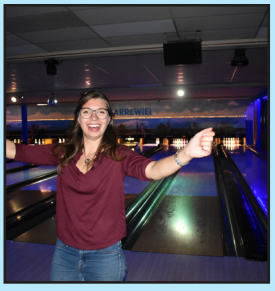
Source: dreamstime.com







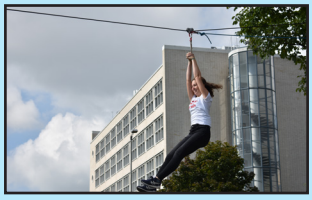
















Credits to Fotosynthecie for the pictures!

ALUMNUS COLUMNUS

GUUS KOLPA

Guus Kolpa, MSc is one of the few Nanobiology alumni. He started studying Nanobiology in its second year of existence and was part of the very first mRNA committee. We interviewed him to find out what life after nano can be like.

What do you do now?

Currently, I am a data engineer for ICT Group. This is a company that delivers ICT services to other companies that want those services. When a company delivers their data to us, we make sense of this data and then present our results to the company. For my job I work in Python a lot. I think this is a valuable skill to have for all students because it is in high demand.

I actually got this job via LinkedIn. A recruiter from the company sent me a standard message to ask if I was interested. The job offer was good, so I decided to go to a one-on-one talk there and I got a contract.

Is your job Nanobiology related?

Absolutely not! In that sense you picked an odd person to interview. I just like to see what comes on my path and go for that. This means that when I finished studying I was not inclined to do something Nanobiology related like getting my PhD. I already studied Nanobiology for five to six years so I do not mind doing something else for now.

Also, during my Master End Project (MEP), I was already considering to do more computer stuff because that was not really in our curriculum. I did a project in which I could combine lab work and bioinformatics. The longer I worked on my MEP, the more I started leaning towards the computer part.

Are there skills that you acquired during your time studying Nanobiology that you find especially valuable now?

It is not specifically Nanobiology related, but more generally linked to technical studies: my work requires critical thinking skills, applying what you learned, and being independent. This independence was also required when I was studying Nanobiology; I started studying in the second year of the existence of the programme so there was not a lot to go off of. This independence teaches you to learn quickly, and I value that ability a lot.

Had I studied something like Applied Physics or Life Science & Technology I would not have been less equipped to do the work I do now but I really enjoyed studying Nanobiology. There is some really interesting stuff in the Nanobiology programme; I could see myself coming back to that in the future.

What was it like to study something that, at the time, was just in its second year of existence?
When I was a student, the Nanobiology programme was very different. It is now definitely a lot more structured, from what I heard. I also think that the courses students have now are greatly influenced by the feedback we gave.

Where do you see yourself in the future?
I will see what comes on my path. I could always do a PhD if I want to go back to doing research. Also, I am still really interested in healthcare and genomics so I might also want to do something with that.

Do you miss studying and student life?
Yes, I do. Although I do not miss the studying itself. My MEP lasted 16 months so I had a long period of doing research, which was a transitionary period from studying to working. However, when I was working on my MEP I still had a lot of contact with other students, which I miss now. I do still show up at activities sometimes, for example at the Hooke drinks on Tuesdays.

Do you have any tips for current Nanobiology students?
If you are a student and you do not really know what you want to do after your studies, you should not worry about it. You still have a lot of time and companies will always want technical students. You should not put too much weight on every decision you make because you are going to do great anyway.

Source: iriesoul.com

IN VITRO MEAT
BREAKING TRADITIONS

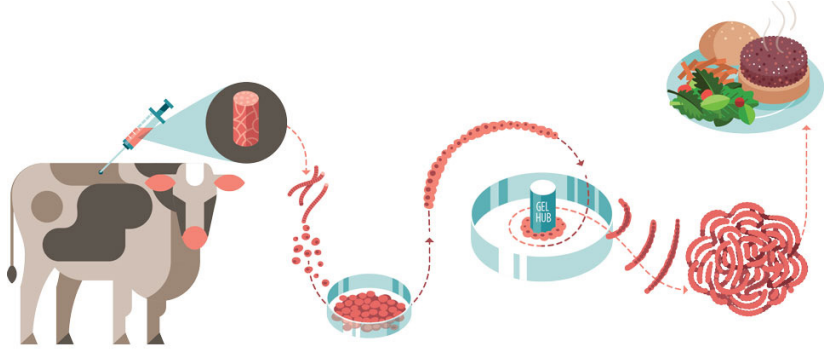
Nowadays more and more people are reducing their meat consumption. This choice is most commonly motivated by the ambition to reduce the animal cruelty and environmental impact that come with eating meat. But what if there were a way to eat meat without these consequences?

Currently there are multiple companies producing lab meat, which is also known as *in vitro* meat or IVM. The companies have not reached their goal yet, which is to viably grow meat so no more animals have to be cultivated for our meat. There are two methods that can be used to create laboratory grown meat: the self-organising technique and the scaffold-based technique.

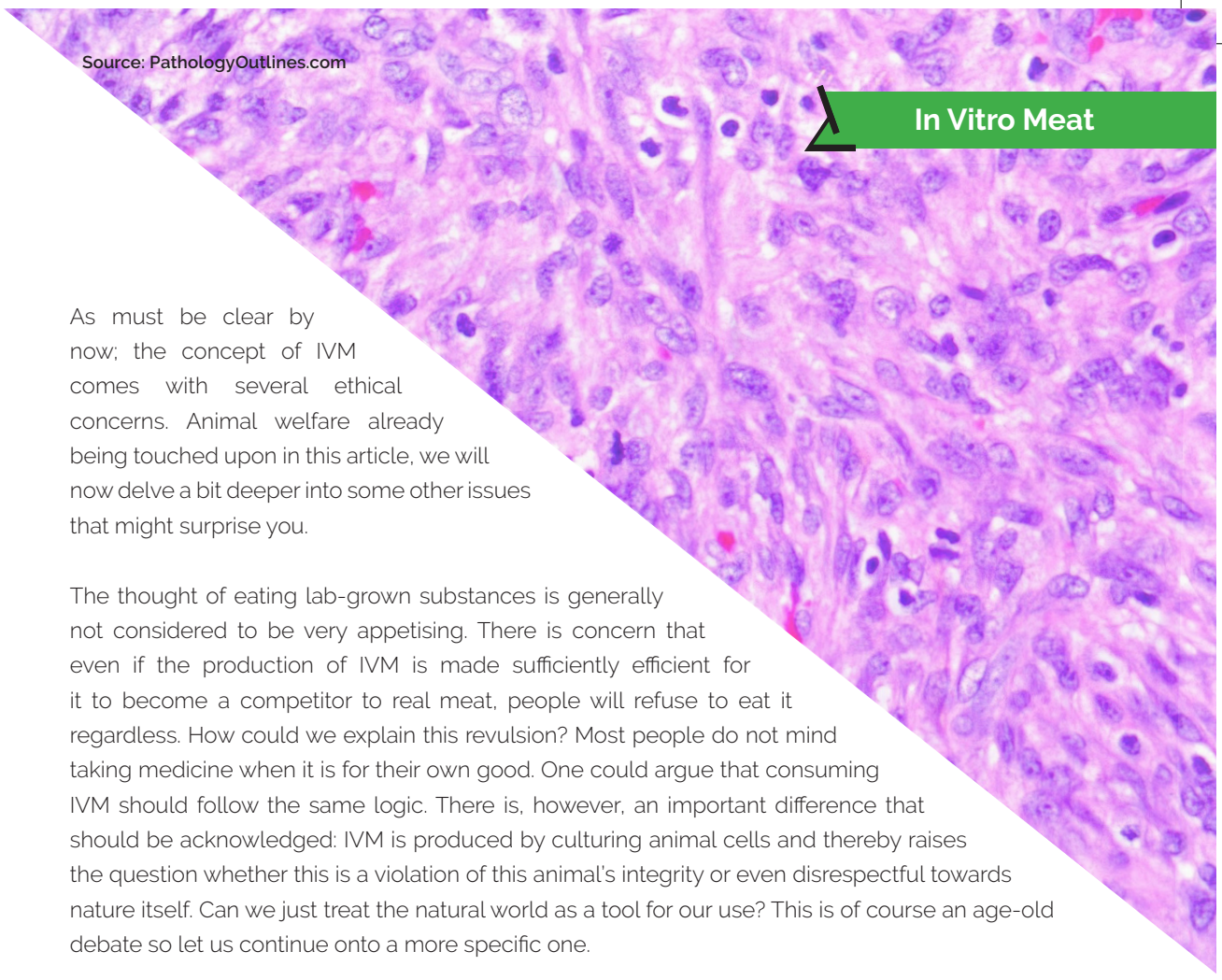
For the self-organising technique, muscle cells of an animal must be kept alive outside the body. These cells can divide, and this will result in a structure that can actually resemble 'in vivo' meat quite closely. This would, however, still require taking muscle cells from animals regularly, making it not completely animal friendly.
The scaffold-based technique uses stem cells that can develop into all different types of cells found in meat but does not yet result in a realistic structure. Currently companies mostly use the scaffold-based method, since it has the greatest potential to become very efficient.

We are already quite far in the process of creating meat that is homogeneous. By combining the right amount of fat and muscle cells, a mixture is created out of which hamburgers or other homogeneous kinds of meat can be made. A big challenge nowadays is to make long muscle fibres like the ones found in steak. Scientists from Harvard University found a possible solution for this: gelatine can be used as a medium that cells can attach to. The resulting fibres were, however, less dense than found in nature.

For the first IVM, fetal bovine serum (FBS) was used. This serum is obtained by isolating blood from the cow embryo, which results in the death of both the mother and the embryo. This presents two main problems: killing cows to produce 'animal friendly' meat defeats the purpose and the serum is very expensive. Finding an alternative to FBS has proven to be difficult since it requires a lot of research to find out which of the many substances are essential.



Source: thegreenlist.com



Source: PathologyOutlines.com

As must be clear by now; the concept of IVM comes with several ethical concerns. Animal welfare already being touched upon in this article, we will now delve a bit deeper into some other issues that might surprise you.

The thought of eating lab-grown substances is generally not considered to be very appetising. There is concern that even if the production of IVM is made sufficiently efficient for it to become a competitor to real meat, people will refuse to eat it regardless. How could we explain this revulsion? Most people do not mind taking medicine when it is for their own good. One could argue that consuming IVM should follow the same logic. There is, however, an important difference that should be acknowledged: IVM is produced by culturing animal cells and thereby raises the question whether this is a violation of this animal's integrity or even disrespectful towards nature itself. Can we just treat the natural world as a tool for our use? This is of course an age-old debate so let us continue onto a more specific one.

One bizarre but not entirely irrelevant concern is that the widespread use IVM might facilitate cannibalism. Cannibalism is now considered to be unethical as it generally involves killing another human being and at the very least the desecration of a corpse; thus disrespecting the dead. Culturing human IVM would not require either so what would stop people from making a case for the consumption of human flesh? Would this even still be considered a bad thing?

The production of IVM does not just reopen the door to classical dilemmas; it also raises a whole new set of questions that we have never had to consider before. The only thing that we can do now is wait and see what answers people come up with.

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A JOURNEY INTO BIODIVERSITY: NATURALIS

IN THE FIELD

Naturalis is the national biodiversity centre of the Netherlands. It was founded in 1820 and has had an exemplary role in the research and exhibition of biodiversity ever since. Many types of plant and animal life are to be seen and experienced. Naturalis contributes to the preservation of flora and fauna, by their continual research worldwide. After a complete renovation of the building, Naturalis reopened its doors this August. The museum has structured its exhibits using seven different galleries. Going to Naturalis is a journey where you experience all these galleries, naturally flowing into each other. I went there to see what the new building brings and to report back my findings to all of you!

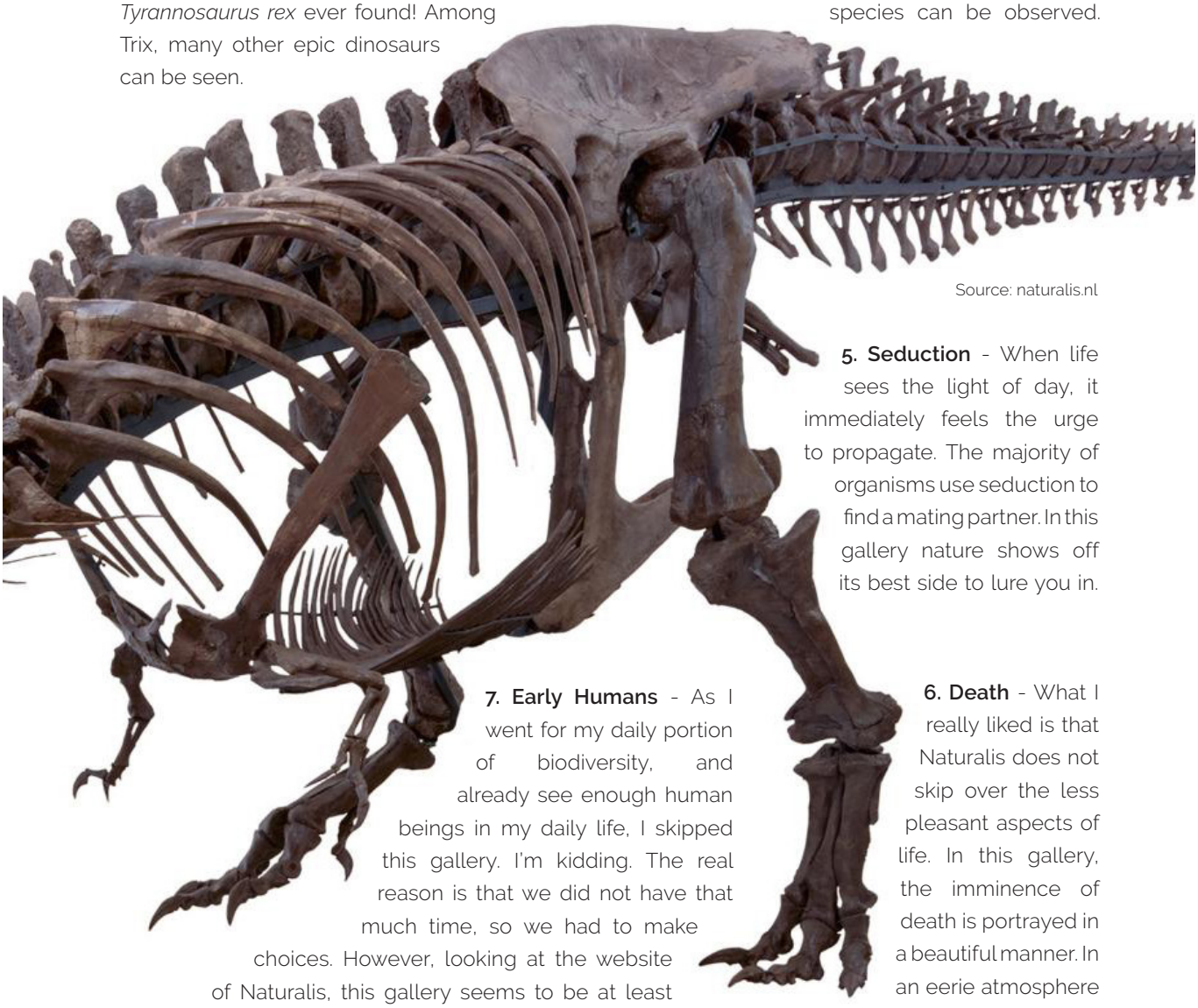
1. Life - You step through the main entrance, get past the ticket booth and start your journey at the first gallery; Life. In various landscapes, life on our earth is celebrated in all its forms. You start underwater with a diverse array of sea life. Passing through the savannah and the prairie, you end up in the mountains surrounded by clouds of birds.

2. Earth - After having experienced the life on earth, you hop into the next gallery, which is all about what is hidden beneath. Earth explores the many minerals and gems that can be found.

Conclusive - My visit to Naturalis was a very enjoyable experience. I was inspired, in awe, and entertained. I would definitely recommend everyone to pay a visit. A small piece of advice: try to make your visit during the week, weekends are crowded!

3. The Age of Dinosaurs - Gems and minerals are not the only treasures to be found underground. At Naturalis one of the largest fossil collections in the world is exhibited, with Trix being the most prized possession of the museum; it is the most complete fossil of a *Tyrannosaurus rex* ever found! Among Trix, many other epic dinosaurs can be seen.

4. Ice Age - After the Dinosaur Age, we arrive at the Ice Age; a time when men and woolly mammoths stood side by side. Using a huge scale model that fills the whole gallery, different species can be observed.



Source: naturalis.nl

5. Seduction - When life sees the light of day, it immediately feels the urge to propagate. The majority of organisms use seduction to find a mating partner. In this gallery nature shows off its best side to lure you in.

6. Death - What I really liked is that Naturalis does not skip over the less pleasant aspects of life. In this gallery, the imminence of death is portrayed in a beautiful manner. In an eerie atmosphere the process of dying is shown, making for an interesting and thought-provoking gallery.

7. Early Humans - As I went for my daily portion of biodiversity, and already see enough human beings in my daily life, I skipped this gallery. I'm kidding. The real reason is that we did not have that much time, so we had to make choices. However, looking at the website of Naturalis, this gallery seems to be at least as interesting as the others, so make sure to pass by and let me know what it was like!

A basis for human rights

At the basis of many human rights laws, we can find the *Nuremberg Code*, which provides some guidelines that have to be followed in human experimentation. Although they are not literally embedded in nations' laws, they are very relevant in, for example, testing new medicines. It was established after the Doctors' trial which was part of the Subsequent Nuremberg trials (1946-1949). In this trial German doctors, who had experimented on humans, were prosecuted. They argued, however, that there was no clear definition of what was legal and what would have been an illegal human experiment, and that they therefore did not break any rules.

> *'The voluntary consent of the human subject is absolutely essential.'*

A code regarding human experimentation had already been issued by the Weimar Government in 1931, but as this was negated by the Nazis, there was no code or law in place. The Doctors' trial led to the establishment of the *Nuremberg Code*, which has as its first point: 'The voluntary consent of the human subject is absolutely essential.' It also includes points stating that human experimentation has to be preceded by animal experimentation, and that, in the case of research into a disease, there should be prior knowledge of the natural history of this disease. The *Nuremberg Code* has been used as a basis for multiple newer codes, such as the *Declaration of Helsinki*, and hereby stays relevant even though it was issued more than 70 years ago.

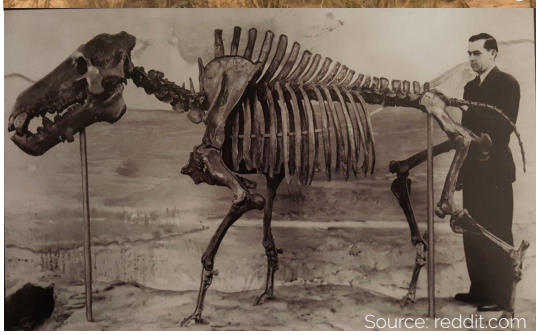
Naming a species

As a (future) nanobiologist, you might just come to discover a new species; probably no bird or whale, but maybe a bacterium or fungus. When you have discovered a new species, you get to name it! But how do you come up with a name? Well, there are some guidelines to follow…

Aphanus rolandri

You are probably super proud of yourself after discovering it, rightfully so, and you might want to name it after yourself. Well, this is an absolute no-go, it is hoggish and forbidden. Talking about hogs, let us address the naming of *Dinohyus hollandi*. It was designated as a new species by O.A. Peterson and he named it after William Jacob Holland; not only a fellow palaeontologist but also his boss. Holland always put his own name first on scientific papers, no matter how little he had contributed. Because of this, Peterson decided to name the giant hog after Holland. What could be a better punishment for such hoggish behaviour?

Naming species after your enemies to make fun of them has been done by many more scientists, including Carl Linnaeus. This famous researcher disliked one of his students, Daniel Rolander, so much that he named a species of beetle *Aphanus rolandri*, where 'Aphanus' means 'inconspicuous' in Greek. This practice has now (luckily) been forbidden by the *International Code of Zoological Nomenclature* (*ICZN*), which states that a name can not give offence on any grounds.

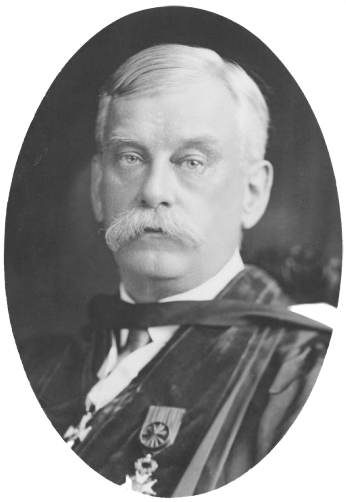


Dinohyus hollandi

Note: Dinohyus hollandi is now widely considered to be the same species as Daeodon shoshonensis, which would be the correct name as it was the first name given to this species.

On a more serious note, there are still names that are debatable because they are offensive or named after people who have done things that are unethical in our current point of view. This is because once a species' name has been approved, it will generally not be changed anymore.

Source: en.wikipedia.org



William Jacob Holland

Certain zoological and biological organisations have stated that they do consider renaming species in rare cases. An example of this is the Jewfish that has been renamed to the Atlantic goliath grouper.

The *ICZN* has an extensive list of rules regarding nomenclature, this includes rules regarding, for example, typography and geographical names. Also, one obvious rule that has not been mentioned yet: the name has to be unique.

Now, how should you name this new species? It is very common to name the species after its appearance or after its characteristics or habits. Also, many people name it after someone who has made great contributions to the discovery of the species or to the field in general. Others use the opportunity to honour someone they personally greatly admire; either a scientist, a close friend, or a relative like their mom.

So start thinking about it already!

TACOS, WRAPS, AND MORE!

S.O.S. RECIPE

Did you know that a wrap is usually classified as a sandwich? The great thing about making wraps is that it is very cheap and easy, and the recipe will never be the same and everyone has their own 'wrap traditions'. Before you invent your own tradition we will give you some inspiration and our take on wraps for the DIES Reveal Drinks!

Ingredients:

- 4-8 flour tortillas or tacos
- 400g can of black beans, drained
- 2 small tomatoes, diced
- 2 onions, diced
- 1-2 cloves of garlic, finely chopped
- 1-2 limes
- 1 cube of vegetable stock
- 1 bell pepper, sliced
- salt and pepper
- olive oil

Optional:

- 150 ml crème fraîche
- 200 g fresh lettuce, shredded
- 200 g minced meat
- Sriracha chili sauce

The wrap

Whether it is a tortilla, a hard taco shell, a spring roll, or even a lettuce leaf, the wrap will be the vehicle for the flavour, so choose wisely.

The filling

This is where this recipe starts to shine. You can put whatever you want in your wrap. Wraps have been appreciated by many cultures around the world, and they have their own traditions concerning the content.

It is supposed to be flexible!

The single best thing about wraps is that you can lay out a set of ingredients, and let guests find the combinations they like! In the end, nobody leaves a meal like this dissatisfied.

Pico de gallo (Mexican sauce): mix the tomatoes, one onion, the garlic, the juice from the lime(s), salt and pepper, and a drizzle of olive oil in a bowl. Serve the pico de gallo cold.

Refried Beans (easy student version):

Warm up the beans in a pot over low heat and add enough water to cover them. Add the vegetable stock and let it dissolve. Using a fork, mash all the beans together to create a paste of the right consistency.

The veggies: simply fry the bell pepper and the remaining onion in a pan over medium-high heat until glossy, spiced to taste.

Now the time has come to make your wrap: fill your tortilla or taco with the pico de gallo, the beans, the veggies, and any of the optional ingredients. Enjoy!

Source sombrero: Vectorstock.com
Source sambabal: clipdealer.com
Source tacos: melmagazine.com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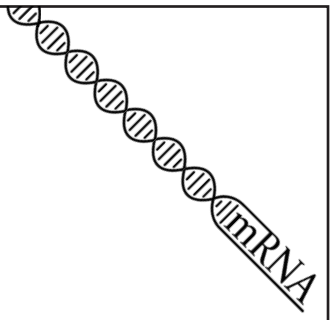

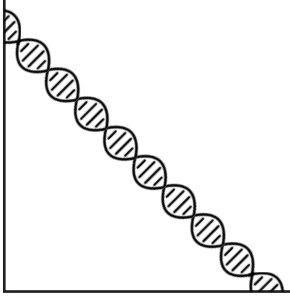

S.V.N.B. HOOKE

Maria Sibylla Merian
Metamorphosis insectorum Surinamensium
Image Source: KB | Nationale Bibliotheek

S.V.N.B. HOOKE

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Metamorphosis insectorum Surinamensium
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RANDI
MARIJN BOTERMANS

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Hey fellow nanos!

My name is Marijn Botermans, and I am one of the new freshmen. My biggest hobby is music and I love going to as many concerts as my tiny student's budget allows me to, which is unfortunately not a lot… I would like to share my experience of one of the most amazing weekends I have ever had with you, which was this year's edition of Pinkpop Festival.

Pinkpop is one of the biggest festivals in the Netherlands and celebrated its 50th anniversary (!) this year. It was hosted in Landgraaf, which is located in the southernmost part of the Netherlands, and it lasted for three days.

It was not my first time going there, but it was the first time I went for the whole weekend. Feeling very blessed to have a girlfriend with a similar taste in music to come along on this adventure, we set out for the festival campsite. We experienced our first proper relationship test pitching up our tent because there were extremely heavy winds (there had been an official storm warning earlier that afternoon). It took us twice as long as expected and made me very grumpy.

Nevertheless, our tent and relationship survived the storm and we were able to enjoy some great performances during the following three days, which made everything better. I will not bore you with a schedule of every band that we saw from hour to hour, but I simply cannot resist naming my favourites.

Some of the acts we saw were George Ezra, Elbow, Golden Earring, Anouk, Cage The Elephant, Mumford & Sons, White Lies, The Kooks, Lenny Kravitz, Bastille, Krezip, Bring Me The Horizon, Slash, The 1975 and Jett Rebel. We also saw Armin van Buuren, which is definitely not my type of music, but I guess it was cool to experience for once.

The best acts were Sunday's and Monday's headliners: The Cure and Fleetwood Mac. The Cure is one of our favourite bands and they lived up to the high expectations. They played their dark, moody, yet beautiful music, packed with well-known hits. On Monday, it was amazing to experience the whole crowd singing along to Fleetwood Mac's timeless hits, such as *Go Your Own Way* and *Dreams*.

We also saw comedic rock duo Tenacious D, consisting of actors Jack Black (*School of Rock*, *Kung Fu Panda*) and Kyle Gass. They might not be the best musicians, although they call themselves the best band in the world and their song *Tribute* is actually awesome, but they sure are born entertainers and their performance was one of the funniest of the entire weekend.
Monday had arguably the best line-up, but it was also raining for almost the entire day. Therefore, I really want to thank the ever so fashionable, brightly coloured rain poncho. It doesn't matter that you might look ridiculous when 50,000 people around are sporting the same outfit. However, the weather could not bring down our spirits and we had an amazing weekend altogether. I am looking forward to next year's festival season!


ANTS, BACON & COOKIES

MRQNA

How many fire ants would I have to eat to change the PH of my stomach by 1?

Leander Lutze

Dear Leander,

Before answering your question we would like to point out that fire ants, as opposed to black ants, do not use formic acid to defend themselves. Fire ants contain a venom instead, which is mainly composed of non-acidic oily alkaloids. If you were to eat a lot of fire ants, this would at some point decrease the pH of your stomach by one because of the acid-excretion reaction of your stomach itself. As this answer is not very ant-specific and a bit boring, we will answer your question for black ants. Assuming that the volume of your stomach is 100 ml, and the initial pH of your stomach is 2.5, you should consume 23.3 grams of formic acid to decrease the pH to 1.5. Ants contain 600 micrograms of formic acid on average. Therefore, you would have to eat 38.9×10^3 ants to decrease the pH of your stomach by 1.

Source: surethingpc.com

A(n)t your service,
mRNA 4.5

Source:ambitiouskitchen.com

How come we cook bacon and bake cookies?

Olivier Koot

Dear Olivier,
Thank you for your thought-provoking question.

Cooking is a general term that refers to any method of preparing food using heat. Baking, on the other hand, is cooking food by applying dry heat, usually in an oven. In short, baking is a type of cooking. From this definition we can already answer one part of the question; we do in fact cook cookies!
As for bacon; baking would work. Usually, bacon contains enough fat to allow the use of dry heat to cook the bacon. However, we usually fry bacon instead of baking it. Maybe the reason for this is that it takes time to preheat an oven, and we are hungry in the morning?

Hugs,
mRNA 4.5

Source: thebakermama.com

UPCOMING ACTIVITIES

HOOKE AGENDA

Christmas holiday	23 December- 3 January
Excursion Baseclear	9 January
Multiple Day Activity Reveal Drinks	14 January
Lustrumbook Drinks	11 February
GMA 3	19 February
Lustrum Multiple Day Activity	22-23 February
Gupta Case Study	17 March
Cantus Hooke x LIFE	18 March
Lustrum Semester 2 Reveal Drinks	24 March

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

Source: pinterest.com