

# Lifeline

AD 1672

## HISTORY

LIFELINE 56  
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EDITION 4



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# PREFACE

Dear reader,

This already marks the last time I get to address you while being editor-in-chief of the Lifeline. It has been an honor and a privilege to be so involved in making the beautiful editions we have seen. And while this edition is all about history, it feels only fitting to look back and feel a sense of pride at what the lovely members of the Lifeline committee have been able to make for you this past year. But of course, we get to continue making our magazine and we will focus this edition on history. History of biology, history of GLV Idun, for this edition, anything worth calling historic will do. We have a fully loaded line-up of articles for you to enjoy, so please do! And while this will be my final address as editor-in-chief, it definitely won't be the last Lifeline I will be working on.

Hugs and kisses,

*Devi Seijkens*

Lifeline editor in chief 2018-2019



Dear reader,

It has already been a few months since the kick-off of our anniversary year. Not only an unforgettable IduNacht, but also this special edition of the Lifeline only occurs once every 100 years. In collaboration with the Lifeline, we take you on a journey through the rich history of biology. We imagine ourselves in nostalgic atmospheres of the past hundred years and look back to the time when our association only had four members and where it all started: the year 1919. This year GLV Idun will organize its greatest Lustrum ever. An organization that has been lovingly supported by the many hands of the committee GBC 100 years. Together we will make it a great year full of fun activities. We are looking forward to the big party on September 21!

Love on behalf of the GBC 100 years committee,

*Yvonne Rietstra*

Chairman committee GBC 100 years

Dear reader,

Lo and behold, this edition's theme: HISTORY! It's something that we all have, will have, and make even more of, in the future. It is moments like this that make me wonder where the time has gone. I remember times in the far, far past; times in which people would give a treat on birthdays that did not consist of diabetes in a wrapper, times where a nutritious mandarin was sufficient. Times where you had to blow in the game slot of your Nintendo console to make it work again. Great times, great times. It is up to us to ensure that we remember these times fondly, lest we forget the path we had to wander in order to achieve the comfort and luxury of the present. Have fun reading.

On behalf of the thirteenth board,

*Jurre Raelveld*

Chairman of GLV Idun 2018-2019



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# SCIENTIFIC NEWS

## *FDA approves ketamin-based antidepressant*

By Lars de Ridder

On March 5th, the FDA (U.S. Food and Drug Administration) approved a new antidepressant based on ketamine. It claims to be the drug which can be administered to people on whom other antidepressants have no effect.

The drug is called Spravato and contains one form of ketamine: esketamine. Ketamine normally consists of two mirror image molecules, esketamine is one of them and is the base ingredient of Spravato. This knowledge is based on extensive research. There has been a trial that provided small doses of ketamine to subjects; they found that ketamine had a rapid antidepressant

*“Other antidepressants often take weeks to kick in, but ketamine and related compounds work within hours or days for some people. Some patients experienced the effects of Spravato in two days, a clinical trial found.”*

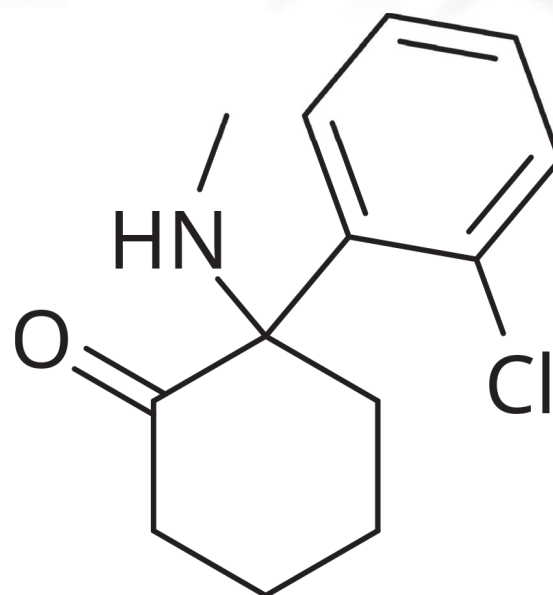
response (with an onset of four hours), and which lasted for several days.

Ketamine is an antagonist of the excitatory neurotransmitter glutamate at the NMDA receptors, which is involved in multiple processes. The mechanism of action of ketamine remained a question to be addressed. The research group reasoned that ketamine, via this pathway,

could increase synaptic connections in brain regions that undergo atrophy and loss of synapses when they are exposed to chronic stress and depression (Duman et al., 2018).

The functional concept of ketamine is the restoration of synaptic connections and to reverse the damage done by depression and stress. As is shown in the image, it is established that chronic stress effects neural spines and networks.

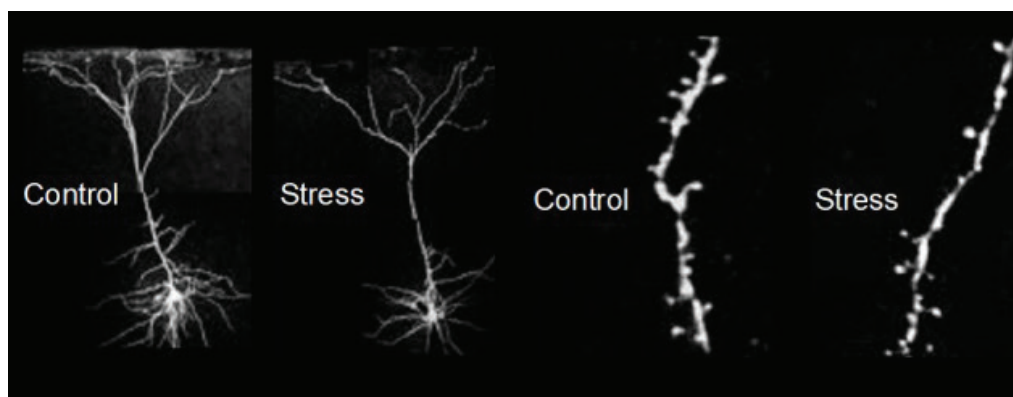
The drug Spravato is approved and therefore it can be administered to patients. For now it is a nasal spray that only a doctor can administer and should be used in combination with



Ketamin molecule

*“The future for novel rapid-acting antidepressants looks very bright, as the drugs currently being tested in phase II and III clinical trials may address some of these issues. With continued efforts, there is hope that there will soon be a number of novel, rapid, and efficacious choices for the treatment of depression and the possibility that these could target the underlying causes of illness.” (Duman et al., 2018)*

oral antidepressants.



*“Preclinical studies show evidence of neuronal atrophy and loss in response to stress. Chronic stress, which can lead to depression, decreases synaptic connections in the PFC and hippocampus. (Duman et al., 2018).”*



## *Bad effects in ‘junk food’ eating bears: faster ageing*

Wildlife ecologist Rebecca Kirby and her colleagues performed a study in which they investigated the effect of junk food and processed food in bears. They published the results in Scientific Reports in February of this year.

The research group was based in Colorado and investigated into the eating behaviours of black bears. They were especially interested in what bears ate and how food has an effect on ageing and hibernating behaviour.

They concluded that processed food was a significant part of the bears’ diet, in some cases about 30 percent of their

*The new research grew out of an earlier project to see what wild black bears across Colorado were eating, says study coauthor Jonathan Pauli, a community ecologist at the University of Wisconsin–Madison.*

After measuring the Carbon-13 levels, they examined the hibernating behaviours of the followed bears. They conclude that bears that eat more processed food hibernate less. On average those bears hibernate between 4 and 6 months a year. It is known that hibernating is

important in ageing and therefore they examined the DNA telomeres of the bears to see if disrupting the hibernation behaviour affects ageing. They found as a result that the bears that were hibernating less, the telomeres were shorting faster.

As a limitation was given that some bears didn’t cooperate, so in future research this link between processed food and ageing in bears should be further dug into.

*Using additional methods to measure telomeres could help clarify what is going on at the cellular level, says telomere researcher Jerry Shay of the University of Texas Southwestern Medical Center in Dallas. Still, he muses, the idea of connecting more human food, truncated bear hibernation and faster cell aging “may be correct.”*



*Looking for the tell-tale forms of carbon in that earlier study, the researchers found bears in some places scavenging “really high” proportions of people’s leftovers. On occasion, these leftovers made up more than 30 percent of bears’ diets.*

# MENTAL ILLNESS THROUGH THE YEARS

Julia Vonk

## 400 B.C.

The Greek physician Hippocrates considers mental disorders as diseases to be understood in terms of disturbed physiology, rather than reflections of the displeasure of the gods or evidence of demonic possession, as they were previously described in Egyptian, Indian, Greek and Roman writings. Later, Greek medical writers set out treatments for mentally ill people that include silence, occupation, and the use of drugs such as the purgative hellebore. Family members commonly care for people with mental illness in ancient times.

## Middle Ages

In general, medieval Europeans allow the mentally ill their freedom, as long as they are not dangerous. However, less enlightened treatment of people with mental disorders is also prevalent, with those people often labeled as witches and assumed to be inhabited by demons. Muslim Arabs, who establish asylums as early as the 8th century, carry on the quasi-scientific approach of the Greeks.

## 1407

The first European establishment specifically for people with mental illness is founded in Valencia, Spain.

## 1600s

Europeans increasingly begin to isolate mentally ill people, often housing them with handicapped individuals, vagrants and delinquents. Those considered insane are increasingly treated inhumanely, often chained to walls and kept in dungeons.

## Late 1700s

Concern about the treatment of mentally ill people grows to the point that occasional reforms are instituted. After the French Revolution, French physician Phillipe Pinel takes over the Bicêtre insane asylum and forbids the use of chains and shackles. He removes patients from dungeons, provides them with sunny rooms, and also allows them to exercise on the grounds. Yet, in other places, mistreatment persists.

## 1840s

U.S. reformer Dorothea Dix observes that mentally ill women and men of all ages in Massachusetts, are incarcerated with criminals and left unclothed in darkness, without heat or bathrooms. Many of them are chained and beaten. Over the next 40 years, Dix will lobby to establish 32 state hospitals for the mentally ill. On a tour around Europe in 1854-1856, she convinces Pope Pius IX to examine how cruelly the mentally ill are treated.

## 1883

Mental illness is studied more scientifically as German psychiatrist Emil Kraepelin distinguishes mental disorders. Though subsequent research will disprove some of his findings, his fundamental distinction between manic-depressive psychosis and schizophrenia holds to this day.

## Early 1900s

The primary treatments of neurotic mental disorders, and sometimes psychosis, are psychoanalytical therapies ('talking cures') developed by Sigmund Freud and his associates. Society still treats those suffering from psychosis (including schizophrenia) with custodial care.

## 1930s

Drugs, electro-convulsive therapy and surgery are used to treat people with schizophrenia and others with persistent mental illnesses. Some are infected with malaria; others are

treated with repeated insulin-induced comas. Others have parts of their brain removed surgically, an operation called lobotomy. This procedure is performed widely over the next two decades to treat schizophrenia, intractable depression, severe anxiety and obsessions.

## 1949

Australian psychiatrist J.F.J. Cade introduces the use of lithium to treat psychosis. Prior to this, drugs such as bromides and barbiturates had been used to quiet or sedate pa-

tients, but they were ineffective in treating the basic symptoms of those suffering from psychosis. Lithium will gain widespread use in the mid-1960s to treat those with manic depression, now known as bipolar disorder.

## 1950s

A series of successful anti-psychotic drugs are introduced that do not cure psychosis but control its symptoms. The first of the anti-psychotics, the major class of drug used to treat psychosis, is discovered in France in 1952 and is named chlorpromazine (Thorazine). Studies show that 70 percent of patients with schizophrenia clearly improve on anti-psychotic drugs. A new type of therapy, called behavior therapy, is developed, which holds that people with phobias can be trained to overcome them.

## 1990s

A new generation of anti-psychotic drugs is introduced. These drugs prove to be more effective in treating schizophrenia and have fewer side effects.





# RATTUS NORVEGICUS

Roos Slijfer

Once upon a time there was a plague of rats in Hamelen. The people begged the Pied Piper to help them and so he came to Hamelen with his flute. He lured the rats in to the Wezer where they drowned. After the people of Hamelen refused to pay him, he came back and lured 30 children with him to the Koppenberg and disappeared. Most people still think rats are disgusting and people thought that through the years, but let me tell you that rats also have been loved as pets for a long time. And their popularity as pets is on the rise again.

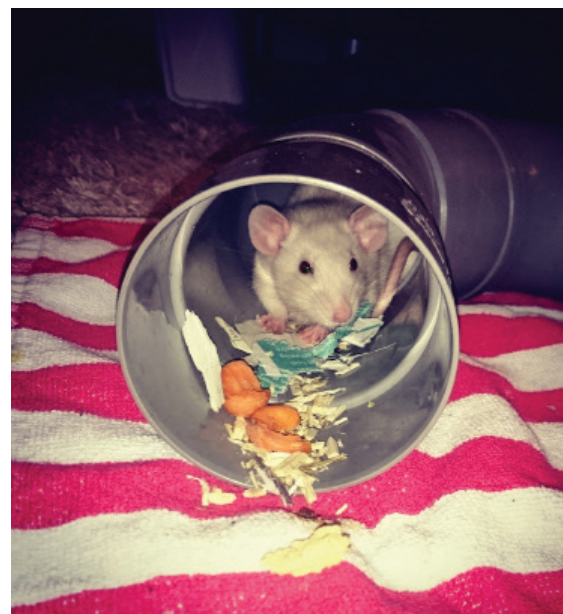
Originally rats are from Asia. The Brown rat (*Rattus norvegicus*) was first seen in Europe in 1720, it came on board a ship from Asia. Rats like moist (yeah, I said it), so ships were one of their favourite places. Rats are actually good swimmers, so now you know the story about the Pied Piper couldn't be true. When people first discovered the Brown rat, they wanted to kill them as soon as possible. Of course some people thought they could make money out of this. This is how special dog breeds came about that were trained to kill a rat in one bite, most of the time these were Terriers. Contests were held to see which dog could kill the most rats in the shortest amount of time. If the trainers of the rat-catchers found rats with special coloured fur they would keep and breed them. Later they sold these rats as, you guess it, pets to the public.



- Pied Piper

A couple years later also scientists saw potential in the little rodents. They used them for different kinds of experiments, mostly to research cancer. It was easier to have rats that are kind and loving toward the scientists than these wild 'sewer' rats, so they began selecting for them based on character. The pet rat as we know it is a close family member of the laboratory rat. This is why pet rats are very sensitive to cancer.

In 1901 even rat shows became popular in England. Here, rats would compete in a beauty pageant of sorts. The popularity of rats grew even bigger because of the 'ratlady', miss Douglas. She tried to introduce the rats as pets to the public because she really wanted them to be loved. Rats are social animals you know. This is also the reason pet rats should never be kept alone. They will show stereotype symptoms of loneliness such as aggression, depression and even self-mutilation. Sadly our 'ratlady' died in 1921 and the popularity of the rat as a pet decreased.



-Loïs, my ratbaby!

So, this is how rats became pets. We have the rat-catchers who wanted to make money, scientists who were tired of getting bitten and a lady who just really loved rats. Everybody who knows me, knows that I love rats. Maybe I am even a little obsessed with them. It all started with one, but in a short period of time one rat became four. And I really want more but maybe I should wait till after my studies. Rats are very smart and you can teach them all kinds of tricks. When I come home, they are always happy to see me! My hearts melts every time. They are just the best pets ever and I would recommend everybody to buy rats. But keep in mind before you let yourself fall in love that rats only live for 2-3 years.



# History of cancer treatment

By Hennie Heida

Cancer goes back a long way. There are even paleopathological findings that indicate the presence of tumors in animals in prehistorical times, thus before men appeared on Earth. The earliest evidence of cancer in humans is a description of a breast tumor at circa 3000 B.C., the time Egyptians were around. Its writer concluded that the bulging tumor was a grave disease and untreatable. When one did attempt to treat the tumors and cancers, it was with cautery (destroying abnormal tissue by e.g. burning or removing it), knives, salts and arsenic paste. In comparison, Sumerians, the Chinese, Indians, Persians and Hebrews tried using herbal remedies such as tea and fruit juice. For advanced cases however, they did not hesitate to use solutions or pastes of iron, copper, sulfur and mercury.

Luckily, we have come a long way since then. We sadly know that drinking fruit juice does not simply rinse our cancer cells away and can give the use of cautery a big pass (hell to the no). Over the years, we have become much more capable of treating cancer, made possible by contributions of many physicians and surgeons.

One of these physicians was the Greek Hippocrates. When the Greeks followed the Egyptians, they involved medicine into a mixture of art and science. Hippocrates and others opposed superstitions as cause of cancer and instead believed it was rather a natural one. You might have heard of the four humors, constituted of blood, phlegm, black bile and yellow bile. Hippocrates believed that excess or deprivation of one of the fluids, particularly at old age, may induce cancer. He was also the one who coined the terms cancer and carcinoma. These terms were chosen since the growth of cancer reminded him of a moving crab, adhering to surrounding structures with its claws.

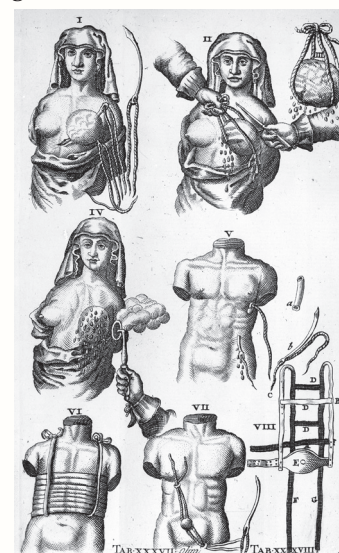
The theory of the four humors held up for quite a while (1000 years) (yes... that is quite a while). Although some knowledge was obtained during this time (symptoms, signs and treatment started to be described, different forms of cancer were distinguished from one another, a classification of cancers was introduced), the theory prevented progress in the treatment of cancer so that it developed rather slowly.

When the theory was dismissed, this signaled together with the first public postmortem dissection the beginning of the Renaissance of arts and sciences, including medicine. Medical books were printed, chemical agents (which the Egyptians and Greeks had introduced) were systematically used in therapy, and postmortem examination of deceased patients became a routine procedure. Surgical and pathological findings started to be compared, and more surgical procedures were introduced. More tumors were described and illustrated, with descriptions distinguishing benign and malignant tumors from one another. Among the books, one was written about the genesis of cancer, and another was comprised of a collection of more than 2000 autopsy reports. But although the tumor pathology was more defined and treatment of cancer by surgery had advanced, it was still with complications and rather primitive. In addition, it was not yet known how to tend to metastasis, something that was still not fully understood. It was not until the 19th and 20th century that surgery really improved. Here, the availability of anesthesia played an important part.

Operations began to be designed to remove the tumor entirely, plus the surrounding lymph nodes. Modern cellular and molecular biology made it possible to understand metastasis. Its understanding was important so as to recognize the limitations of surgery. Hereafter, systemic treatments were used after surgery for destroying cells, sometimes also used prior to surgery. Surgery became combined with chemotherapy and/or radiation and became aimed at minimizing removal of healthy tissue. Imaging tests like ultrasound and CT scans emerged, replacing exploratory operations. Today, doctors are trying to minimize the use of surgery even further; special instruments are used to operate through narrow tubes put into cuts in the skin. Other ways are studied as well, like the use of liquid nitrogen, lasers and radiofrequency ablation for killing cancer cells.



The four humors



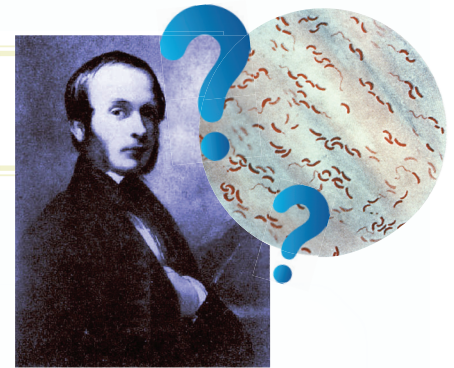
The mastectomy technique, 1655



# Cholera: air or water

## Did John Snow know something?

By Meiske Pieters



The discovery that germ-contaminated water is the source of cholera takes us back to 1854. Because of John Snow's discovery (no, not the good-looking "you know nothing Jon Snow" from Game of Thrones) the sanitary facilities started improving in the mid-19th century. We now know cholera is an infection caused by the bacterium *Vibrio Cholerae*, which causes diarrhea and can leave you dehydrated in 24 hours, among others. The symptoms can start as soon as a few hours after ingestion of the bacteria. Transmission often happens by the fecal-oral route, meaning one person ingests contaminated food or water and their poop gets in contact with another person's mouth. This used to happen by poor sanitation but in developed countries nowadays it most commonly happens by eating contaminated food. However, in developing countries transmission happens more often through water. A recent outbreak was in Mozambique in March of this year, where cyclone Idai caused big areas to overflow with water. Cholera can spread easily and fast in shelter camps. Lack of clean drinking water is also not helpful in preventing spreading of the disease. What happened back in the 19th century though?

Before the cholera outbreak in 1854 in the Soho district, there had already been two major outbreaks in 1832 and 1849 with a total of 14,137 people killed. The relation between cholera and contaminated drinking water was first described in the medical world in 1849, by the earlier mentioned John Snow. However, people didn't believe water was the key. It wasn't until one year after the Broad Street cholera outbreak that Snow's theory was perceived as true, after he incorporated his results of his investigation of the epidemic in Soho. The miasma theory was another theory, which stated cholera was caused by particles in the air. According to this you could get cholera if you got infected by these miasma particles. We now know there is no such thing as a

harmful form of bad air but back then they thought miasma came from rotting organic matter. But John Snow knew something was up and was sceptical of the miasma theory. You should know that the germ theory wasn't yet established at this point, Louis Pasteur did his experiments on the relation between germs and diseases in the early 1860s. But how did John Snow discover that water is the key in transmission of cholera?

To prove his doubt and confirm his theory, Snow conducted an investigation among the local residents. He could then determine a public water pump to be the source of the outbreak. He later made a dot map, illustrating the cholera cases that occurred around the pump. The areas where this pump was the closest water source, had the highest prevalence of cholera cases. The authorities removed the handle of the pump, thus disabling the pump. Later, with help of a local priest named Henry Whitehead, it was discovered how the pump got the cholera bacterium. Apparently, the nappies of a deceased baby were thrown in the cesspool under a house near the pump. This baby died before the detection of the outbreak, meaning this was patient X. The cesspool was poorly built and leaked the bacterium in the soil around it, as well as in the sewer. Only a meter away was the Broad Street well, which water was making these people sick. All of this helped grow the sanitary movement because people realized throwing your poop in the streets and drinking filthy water isn't good for your health. Shocker. The sewer system in London used today, was actually built in 1859. Also, not only cholera was defeated but diseases like typhoid and typhus were also a lot less common. Turns out John Snow knew something after all.

Important note: John Snow is also known for his important work in the development of anaesthesia, however I don't have a lot of room left on this page. So, you will have to consult Google for more information about that.



John Snow's dotted map.



# A GENE BY ANY OTHER NAME

By Dana Frank

What is a gene? Ever since its surfacing in our knowledge about living things we have quibbled and pondered the best way to encompass it in a short explanatory statement. But the concept itself has changed dramatically over the last century and is still outlined differently by scientists who study it from varying perspectives. The answer to the question will, therefore, depend on whom you ask and when.

The journey began in a Moravian Monastery, around the mid-eighteenth century, and involved the meticulous examination of some celebrated legumes. Mendel suggested discrete hereditary packages that in some way appeared to obey laws and yielded a marvellous pattern; one that gave rise to a mosaic of diversity in various forms while preserving the underlying causal elements in generations hence. Though he did not call them so, he was the first to observe genes in action.

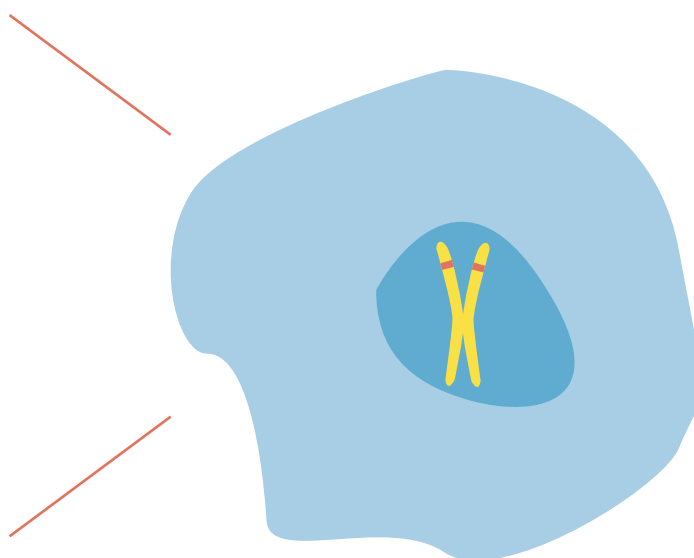
But the discipline with which we are so intimate nowadays only really began several decades later. In the 1900s, Mendel's ideas, after having been brutally ignored for the time between, were finally being revisited. The work of biologists including that of Dutchman, Hugo de Vries, paved the way for research in replicating the Monk's data and rekindled the intellectual fire that was suffocated for so long. A 'chromosome theory of inheritance' broke the ground further, by proposing a relationship between the 'stuff' in the nucleus and heredity. The term gene was coined around that time too and refers to the ancient Greek word for offspring, though what physically composed it was not yet clear.

In the early 1940s, an experiment involving bacterial transformation conclusively killed the debate over biological information carriers. It showed that the DNA component of chromosomes was responsible for the transgenerational conservation in the morphology of bacterial cells and not, as some assumed, the peptide chain. After Watson and Crick had their way with the scientific community in the 50s and genes were given a shape, biologists began describing them with a definite spacial boundary.

Of course, this definition quickly became tricky. Absolute boundaries do not exist in genetics. Direct interactions between

a single gene, a single mRNA and a single protein, are rare. To complicate matters yet further, we can no longer attribute inheritance solely to DNA. The principles of epigenetics became acknowledged even though they were strictly non-Mendelian. We now know, that the 'status' of genes can be modified and inherited through generations. The initially dimensionless point on a chromosome became more nuanced but therefore less specific. Instead of encoding 'protein', we may now say 'anything functional', which includes RNA. This definition seems to be the preferred version for modern biochemists.

It wasn't until Bill Hamilton published his paper on kin selection in the 60s that the gene became of interest to ecologists too. The idea that organisms are merely disposable containers



which wander about for a given time solely to make copies of the codes that drive them, emerged. Survival of the fittest became the survival of genes. It was this inherent immortality that provided the gene with a new role, namely as the unit of heredity, and by extension, the unit of selection. This definition had the merit of avoiding the arbitrariness for which previous versions could be faulted. In any case, it brought forth a novel point of view and added to the conceptual understanding of a once seemingly straightforward idea.

The ways in which we comprehend ideas in science change over time. Things which previously appeared simple, often reveal themselves to be multifaceted and the field of genetics does not fail to adhere to this rule. It can therefore be frustrating to embrace a rigid worldview when it comes to defining things in biology. It is clear that strict definitions cannot encompass everything. After all, a gene by any other name would smell as sweet.

# THE RISE AND FALL OF THE KING OF POP

On August 29th 1958, an event took place that changed the course of pop music. Although nobody knew it at the time, the man who many believe saved pop music was born. His biggest hit record, released in 1982, when he was 24 years old, is still the best selling record of all time in the world and was re-released in a time when music sales were at an all-time low, due to economic recession. But his work transcended music into music videos and innovative dance moves that are still being mimicked to this day. He was the self-proclaimed King of Pop, others called him Wacko Jacko because of some of his crazy antics. You guessed it, I'm talking about Michael Jackson.

Michael Joseph Jackson was born in Gary, a city in Indiana, as the eighth child of the Jackson family. While both of his parents had a large affection for music, they worked average jobs while raising their fa-



By Devi Seijkens

## MUSIC SECTION

mily. When Michael was 5 years old he joined the music group formed by three of his brothers, Tito, Jermaine and Jackie. They became known as the Jackson Five singing group. After winning some local talent shows, their father started booking them to sing in more respected venues. Michael started taking up more of the lead vocals in 1965, when the group was renamed 'The Jackson 5'. All Jackson brothers have been vocal about the harsh punishments their father would give them after mistakes during rehearsals during their time as The Jackson 5. Joe Jackson would often sit in a corner with his belt ready to punish any of the boys when they made a mistake. Michael often described his childhood as lonely and isolating.

During his success with the Jackson 5, Michael got his first taste of solo success, most notably by releasing the well-known 'Ben' in 1972. He didn't start focusing on his solo work until 1975, when he started working with producer Quincy Jones and released 'Off the wall' in 1979. Hits from this record include 'Don't stop 'till you get enough' and 'Rock with you'. It wasn't until 1982 however, that Michael's impact came to its peak.

In 1982 Michael Jackson released the album that would go on to become the bestselling record of all time: 'Thriller'. All 7 songs on the album were released as singles, which was very unusual at that time. The first single off the album was 'The girl is mine', a duet with former Beatles member Paul McCartney. In 1983 the song Thriller was accompanied by a 14 minute epic music video that changed the way music videos were made and was a big stepping stone to MTV's increasing popularity. Although not as iconic, the songs 'Billie Jean' and 'Beat it' had memorable music videos of their own. The

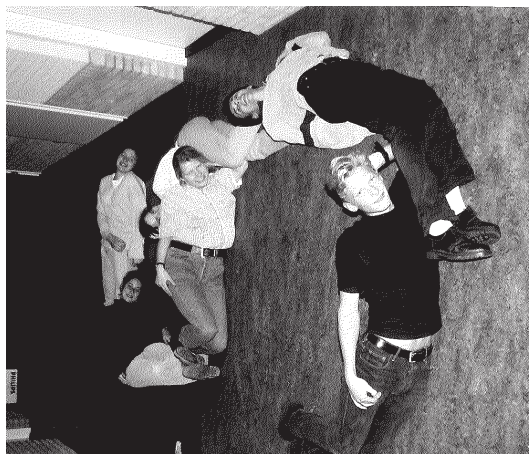
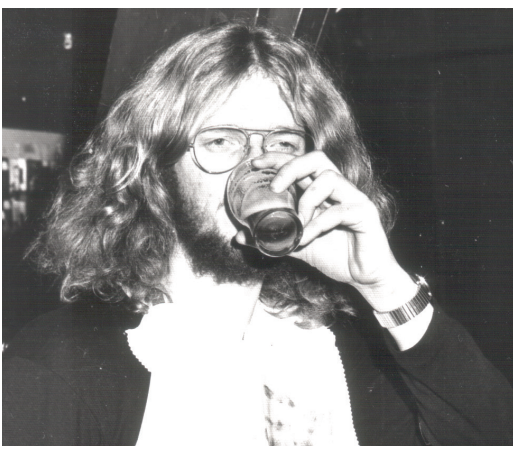
former with the street tiles lighting up, while the latter included a street fight dance during the guitar solo performed by Eddie van Halen.

After Thriller, Michael released 4 more albums, all of which were successful in their own right. But unfortunately on June 25th 2009, three weeks before he was supposed to start his final concert tour, Michael Jackson was found dead from cardiac arrest. His memorial service was held on July 7th, with the likes of Stevie Wonder, John Mayer, Usher and many more performing at the event. It was one of the most streamed events in history, with a US audience of 31.1 million, further attesting to the impact Michael had on the lives of many people. After his death, the movie 'Michael Jackson – This is it' was released for a short two-week span in theaters around the world. It became one of the highest grossing documentaries of all time. It documented Michael's preparation for the equally named tour he was to start 3 weeks after his death. The movie detailed how Michael was still able to sing and dance as he could when he was much younger. Although it wasn't the goodbye many were hoping for, it perpetuated the legacy Michael tried to leave behind before his untimely death.











# DA VINCI'S UNPUBLISHED BIOLOGICAL THEORIES

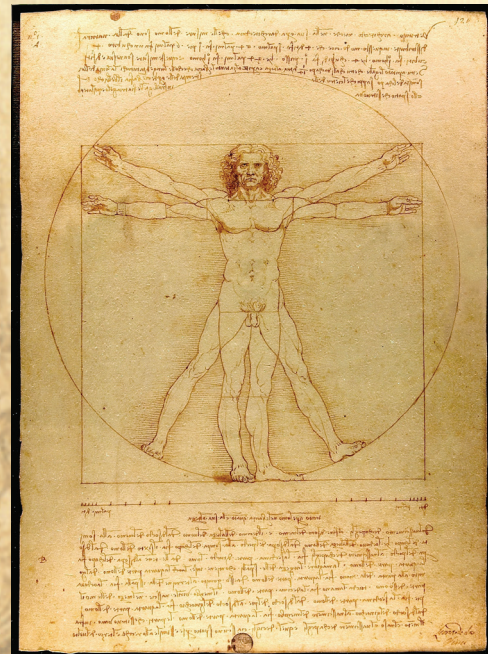
By Jente Zeubring

Leonardo Da Vinci, who lived from 1452 till 1519, known to invent all kinds of futuristic inventions and theories. He is the prime exemplar of the universal genius or Renaissance man because of his many interests. Da Vinci is famous for painting the Mona Lisa but also for inventions like the parachute and the helicopter. Something more biological is his drawing of the Vitruvian Man, a man who is perfect in proportion. He had some remarkable theories about the human body at that time. However, he did not publish any one of those theories. Therefore his findings did not directly influence science. But still, it is fascinating.

Da Vinci's studies can be categorized with the renaissance humanism. Their followers believed in a literary-inspired education movement. Most of the studies were only in text with almost no illustrations. So renaissance humanism recognised no mutually exclusive polarities between the sciences and the arts. Da Vinci's studies in science and engineering are sometimes considered as impressive and innovative as his artistic work. In his notebooks you could see pages full of notes and drawings, he fuses natural philosophy and art together. But next to that there were also lists of groceries on the same page next to an anatomic drawing of a bird's wing. Also seeing one of the pages can confuse you a lot. This because he wrote in mirror-image cursive. Da Vinci was left handed, so it was probably easier to write from the right to the left.

One of his big moving works was the anatomy and physiology of the human body. He started his study as a pupil of Andrea del Verrocchio. Because Da Vinci is an artist he became quickly a master of topographic anatomy. He would draw different views of the arm in different types of texture (skin, bone and muscles). This gave a clear picture of the anatomy of the human body. Therefore he was given permission to dissect human corpses at different hospitals in Italy. His drawings applied to a prefigured of the modern science of biomechanics. But he also made the first drawing of a foetus in utero. The drawings and notation are far ahead of their time, and if published would've undoubtedly made a major contribution to medical science.

Next to the human body he also did several studies on other animals, comparing them to the human body. He made a link to having a common ancestor. And studying fossils led him to hit upon the rudimentary theory of evolution. But since he heresy never published this theory or spoke about it in public, it is likely that if he did formulate such a theory, he kept his ideas to himself. Eventually Darwin published his theory of evolution.



His love for flowers and plants led him to study and sketch the makeup of trees and flowers. He came to some surprising conclusions. One of those is that he wrote as if it was an axiom that if at any point during a tree's life you measured the thicknesses of all of its branches (excluding the central trunk) and added those thicknesses together, the final value would equal the value for the thickness of the trunk itself.

Thanks to Da Vinci and his works we have a lot of modern technologies, luckily also in Biology. One of the most incredible minds ever lived. Leonardo Da Vinci still make us wonder about the many discoveries he has made and continues to elude the minds of modern scientists.



# THE HITCHHIKING CONTEST

By Iris Hendriks

My GBC years seem another life, 1993-1998 (well, really I never did revoke that membership, thanks to automatic membership renewal...). Twenty-one years since I graduated Marine Biology, and I got more or less where I aimed to be that graduating day; I did emigrate to a warmer place with great underwater visibility, dive regularly and get to call myself a Marine Scientist. However as that famous Chinese proverb “Be careful what you wish for, lest it come true” I do wonder frequently if it was all worth it. I am a scientist at the Mediterranean Institute for Advanced Studies in Mallorca, part of the Spanish Research Council and a civil servant (didn’t imagine that part) in Spain. But with the corresponding strangling bureaucracy, low salary and scales that have not gone up since 2003.

I can’t complain though, the crisis seems over and I have plenty of work and opportunities to travel. Which I always have enjoyed and brings me to the origins of the GBC Hitchhiking contests in 1994.

What better idea for penniless, travel-loving biologists than go on a long Ascension Day/weekend hitchhiking trip. In 1994 the BEE (BuitenlandCIE) organized the first contest to Copenhagen. As first-years we were eager to jump to the opportunity and left the country at Nieuweschans at hours only ornithologists should be seen in the field. It was a big success and we had a great weekend in the city eating hotdogs (foodtrucks were already trendy there in ’94) and going to Tivoli. We might have started the long tradition of annoying the locals back then by bouncing plastic bottles and mimicking alarms meant to motivate guests to vacate the premises (and please leave your wallets) to get some space. After that, we had no reserves to join the next year (1995) when we hitchhiked to Bussang (France). We visited a local discothèque, discovered the French rural art of drinking and driving (still popular in rural Spain) over deserted backroads to get back (and vomit along the way) and might have tried to borrow sugar from some neighboring tents after a game of toepen (if you lose you have to drink and/or perform a dare). In any case the neighbors were not happy and turned out to be a bunch of motor cyclists getting up very early the next day to continue their journey. But before they did some rounds around our encampment, impressive from the inside of the thin tent cloth. Anyway motor cyclists don’t

take hitchhikers so no friends lost. The year after the contest had to do without marine biologists because of the marine biology excursion to Corsica, where many a love for the underwater Mediterranean started. But that was actually fortunate as the competition set the end goal on the isle of Wight, and the channel proved too difficult to cross hitchhiking for most. In 1997 we went back to Denmark, this time Ebeltoft. We made a camping party livelier by joining the elderly dancing and were unjustly repaid by being woken up, once again before respectable hours, this time by the camping owners explaining that “we don’t do this in Denmark”. Maybe that explains the next three years went to solid and respectable (and beer-loving) Germany, Königstein in 1998, Oberried 1999 and Usedom in 2000. But even if we kept joining after graduating, it has never been like those first years. And it never will, apart from changing currency, running out of Kroner, imagine not knowing who is going to be at the agreed site, and when, because we had no mobile phones. That magical moment in Bussang where everything seemed possible, including staying drinking beer in the sun forever.

*AND  
NO  
INSTAGRAM  
TO  
BETRAY  
OUR  
WHEREABOUTS.....*

KØBENHAVN

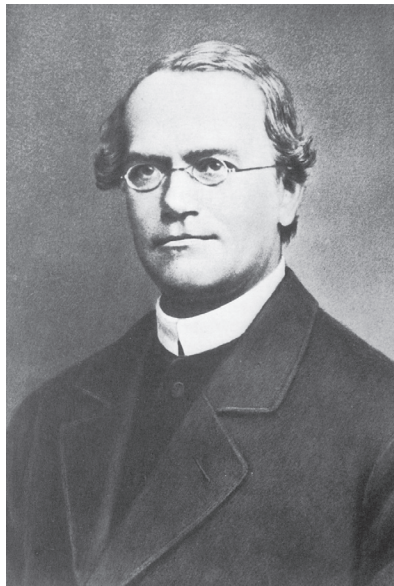


# A BRIEF HISTORY OF GENETIC ENGINEERING



By Soheila Jalali

Humans have been messing with the genetics of our fellow organic life forms for what is arguably most of our history and pre-history. Our favourite co-inhabitant and companion – dogs are actually a product of our own manipulations even before we had any clue what genes or DNA were. A lot of our favourite fruit, vegetables and grains too, arose from calculated breeding techniques that allowed humanity to manipulate the environment and resources around them. In fact, by the time “the father of modern genetics”, Gregor Mendel, started observing and studying the heritability of traits like height and flower colour in pea plants, they were probably already a genetically altered version of the original pea plant (whatever that may have been).



< Gregor Mendel

Either way, “modern genetics” and genetic engineering actually begun taking shape around the 1950s, almost a century after Mendel’s work. At the time, Watson and Crick first described the double helix based on X-ray diffraction images from Rosalind Franklin. Soon after, a scientist called Arthur Kornberg established the ability to replicate DNA synthesis in vitro by isolating the DNA polymerase enzyme. The discovery earned him a Nobel prize and paved the way for an array of possibilities in biotechnology. This was soon followed up in the 1960s with the isolation of GFP and its development as a tool for visualisation at the molecular level. Today, fluorescent proteins of various colours are used in almost every type of experiment and are one of the most convenient reporters used in simple and complex experiments alike.

The golden age of genetic engineering however, began in the 1970s. This was fuelled by a few crucial discoveries in the late 1960s and early 1970s. Namely, the process of ligation and the ligase enzymes as well as the discovery of restriction enzymes built the base for the first “cutting and pasting” experiments in DNA. Paul Berg was the first to perform this trick and prove that fragments of DNA can be joined together. Nowadays, most students learn about basic restriction enzyme digestion and ligation during their bachelor’s or even in high school. The iGEM (a student genetic engineering competition) for example, uses a standardised, open source method of restriction digestion and ligation for the creation of “BioBricks” that are then easily used collaboratively. However, the early days of recombinant DNA (rDNA) were fraught with uncertainty (as they still are to some extent).

The ability to mix DNA from different organisms gave rise to several concerns about the potential unethical uses of such technologies. So, in 1975, an iconic conference was held – the Asilomar conference – which brought together scientists and experts from the field of biotechnology. They laid down essential guidelines and ethical regulations leading the field to truly flourish in a responsible way. Thus, the 1980s saw an acceleration of discoveries and uses of DNA technologies from the first transgenic animal, to PCR and synthetic insulin produced in bacteria! Even the first recombinant vaccine (Hepatitis B) and the first deliberately engineered crop (Bt corn) were a gift from this decade. Crucially, a new method of more precise genetic engineering was developed with the discovery of Zinc Finger Nucleases (ZFNs). This technique was a precursor to CRISPR (2012) and TALENs (2011) that dominated almost two decades of genetic engineering history.

Overall, the 90s brought many new developments into the world of genetic modification and even Dolly the sheep was a millennial! But the turn of the millennium was the real turning point and it has never been a better time to be a life scientist. We now have the ability to achieve almost any type of genetic modification we can think of. We are using gene engineering and CRISPR-Cas technology to change the ways in which we tackle disease, improve the ability of humanity to feed itself and even create sustainable materials. Predictably, of course, ignorance is prevalent and people who may flout regulations are aplenty but if you ask me, there has never been a better time to be an organic life form!



# THEY SHALL NOT GROW OLD

*By Jonah Fedde Renting*

Alright let's begin. Normally I do reviews about fun and light-hearted films. But not this time, this time I'm doing a review about a film that makes you think and reflect. I'm talking about the wonderful film-documentary "They shall not grow old".

"They shall not grow old" is a documentary (made by Peter Jackson) about the first world war or how it was known then, the Great War. The film is quite astonishing to see because it uses old Great War footage from the Imperial War Museum. This footage has been digitally enhanced and coloured to an astounding degree, which gives the film a whole other level of emotion. Now you can clearly see the look on the faces of the soldiers, the explosions from mines in no man's land and that there was a terrifying presence about artillery in this war. It is without a doubt terrifying and you can't help but wonder how war could be the answer to anything.



"They shall not grow old" doesn't follow a specific storyline. In the film there is hardly any reference to certain battles, locations or figureheads. Instead it focusses on many individual short stories, quotes, experiences and living conditions that together make a complete narrative. In the words of Peter Jackson himself: "I didn't want individual stories about individuals. I wanted it to be what it ended up being: 120 men telling a single story. Which is: what was it like to be a British soldier on the western front?"

As previously said the film is about British soldiers, since it uses footage of a British institution, but during the film they also address their German 'enemies' and the way the British soldiers saw them. But I will stop telling the topics that come forward, because I don't want to spoil everything.



This film is without a doubt impressive, beautiful and terrifying to watch. The importance of history is not only to understand how our civilisation developed but also to learn from the mistakes that were made along the way. A lesson that is all too often forgotten by us and our politicians. I therefore recommend this film to everyone, because it shows and tells a story about a truly defining moment in human history.



*"They shall grow not old, as we that are left grow old:  
Age shall not weary them, nor the years condemn.  
At the going down of the sun and in the morning,  
We will remember them."*

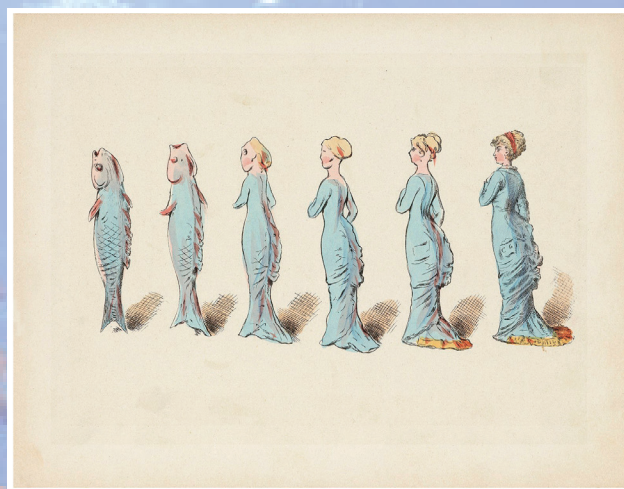


# The Origins of Humanity

By Nadia van Eekelen

Even though history has never been my favourite subject, I still like many of the stories of the past and read about people's reasoning and thoughts from thousands of years ago. So for this Lifeline's theme, I chose to write about a Greek philosopher named Anaximander, who attempted to explain the origin of humanity. Bear in mind that in his time, there were far fewer scientific methods and techniques for research available, and that even today the origin of life remains an unsolved problem.

Anaximander the Milesian (610 BC – 546 BC) is often referred to as the first proponent of evolution, but his theories seem very bizarre compared to the later theories of evolution proposed by Charles Darwin. Although much of the work done by Anaximander is lost in time, like most of the work of the Greek philosophers, he was the first to hypothesize about relationships between animals and humans. His thoughts about the origins of humanity and the evolution of species sound absurd and almost comical, but follow a legitimate chain of reasoning.



Anaximander's theory was translated into many languages, which led to some different stories in other translations. For example, found in a Latin text is that men were held captive inside these fish until puberty. When they were able to defend themselves, they were thrown onto the land. Only after the spiny skin burst open, men and women came out, now able to feed themselves. However, this is so different compared to the other stories that it is possibly just a very bad translation from Greek.

He started with comparing humans to animals and found out that humans take a longer time to rear than most animals, and that children cannot find food for themselves. He hypothesized that humans must therefore have originated from another species that was completely self-sufficient from a young age, since we could not have survived in the ancient world in the same way we do now.

He then took the existence of fossils into account, and claimed that animals originated from the sea. He believed that fish or fishlike animals emerged from warmed up water and earth, and that these animals swimming in the water were protected by a spiny skin. Humans were born inside these fish and when they came onto dry land, the spiny skin would dry up and break. Humankind had to adapt their behaviour to suit the new environment, resulting in us being who we are now. Fish were therefore created first, and gave rise to humankind through this process.

As I said before, his theory is quite comical. However, the basic principle behind this idea is very insightful and one of the most important contributions to the history of biology. Although it is not yet certain, most of us learned in high school that life emerged in the sea. Of course in a way that not even closely resembles Anaximander's thoughts, but the theory likely came forth from his ideas. Anaximander's theory on the origin of humanity formed the foundation of Darwin's theories, with which we are familiar today. So whatever unusual, weird theory you might have about something, just write it down. Based on this story, you never know how right you might be.



# The Homo's

## A Story Of A Special Species

By Diana Nacy

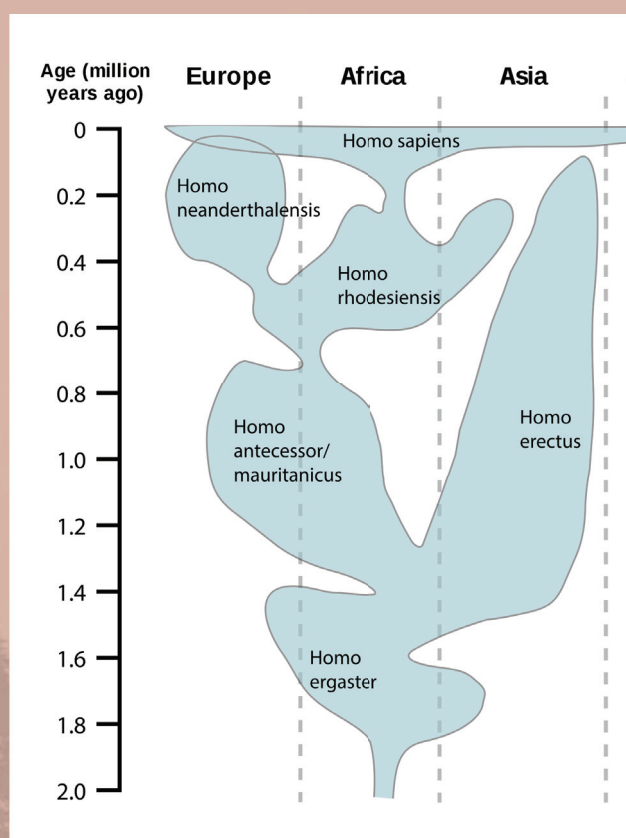
Before the internet, cars, airplanes and just about everything else, all that existed was nature and animals. While some apes succeeded in making instruments to defend themselves and to eat, there is a particular species which succeeded in making inventions that would change their destiny forever. The fact that you're able to read and understand this, makes you one of the Homo sapiens. Congrats! But who exactly are the Homo sapiens?

While many still reject the idea of us being mere animals, because we always like to think so highly of ourselves, we really are just members of the genus Homo. Our family is Hominidae which makes us from the primate order. For hundreds of years, we thought that we were the one and only specie of our genus, but we're not. Long before us, individuals from Homo erectus, Homo Soloensis and many more roamed the earth too. Some big, some small and some of them, like the Homo floresiensis, reached a maximum height of one meter. I'd really like to think of them as the real life hobbits. The most well known non-sapien species is of course the Homo Neanderthalensis, who lived in Eurasia. It's a common fallacy to think that we evolved in a straight line from the primitive apes: The lesser apes begetting ergaster, ergaster begetting erectus, erectus begetting neanderthals, and the neantherdals evolving into us. You know the picture of sapiens, neanderthals and a chimpanzee walking after each other. This gives the mistaken impression that only one human species inhabited the earth at any particular moment.

In truth, your ancestor and mine may have encountered some neanderthals or other human species at a given time in history. We know that about 1-4% of our DNA is neanderthal DNA which makes us believe that we have had sexual encounters with them. There were not that many of them though. Maybe because our build is different; we are smaller in size while the neanderthals, for instance, are bulkier and bigger. Or maybe we just didn't find them as attractive as individuals from our own species.

Why are we then left alone without brothers and sisters from another species? That's something we'll probably never find out. We think it might have been the competition and food scarcity that led them to instinct. But, knowing sapiens, we might have terrorised them and murdered them because we're such a terror to everyone. Guess we'll never know!

Even though we're the ones who pushed the limits the furthest, we're not the most durable human species to have ever lived. While we've been around for only 200.000 years, the Homo erectus lived for 2 million years! It seems unlikely that we're going to make it for another thousand years alive, so 2 millions is definitely out of our league.



You might wonder why another species didn't come as far as we did. After all, we were so similar that we occasionally chose to have sex with individuals from another species and yielded fertile offspring. Some of them even had brains as big as the sapiens brain. But what makes us different? Well, until about 70.000 years ago, we didn't enjoy the sophisticated cognitive abilities that we do nowadays. This change in our way of thinking can be attributed to an accidental genetic mutation that changed the wiring of our brains. In a relatively short amount of time, we came up with everything we now know: from art to science to religion and politics.

A small mutation can go a long way. From an underdog species to dominating the earth; we've come a long way thanks to luck and genetic mutations.

# Review: oldtimers licorice

By Devi Seijkens

In this amazing edition of the review we will be taking a look at one of the best typically Dutch candies ever: Licorice. Specifically, we will take a closer look at some of the 'Oldtimers' branded licorice, which is perfectly in line with our theme. Licorice is a type of candy based on licorice root extract. It is often mildly to very salty but can even be sweet. Other ingredients often include ammoniumchloride, sugar and some kind of binding substance, such as Arabic gum, starch or gelatin. For this review we used the 3 most commonly known 'Oldtimers' types of licorice, as well as an extra type made by the same manufacturer 'Autodrop'.

The original Oldtimers licorice were invented by Douwe Douwenga, a licorice maker for the Van Slooten firm. Douwenga first came up with the idea for the 'Echte mildzoute Hindeloper ruitjesdrop' in 1924. The idea for the shape of the licorice came from Douwenga being stuck in a bathroom for 4 hours, with only a small diamond shape hole in its door. In 1936, Douwenga thought his boss asked him to make licorice knots, and he invented a sweet licorice with sailor's knots on them: 'Echte volzoete scheepsknopen drop'. However, in Dutch, the word for knot and button are the same. And while Douwenga came up with a delicious new treat, his boss was looking for button that could be used in clothing. Douwenga's son, Jochum, was responsible for the invention of the 'Echte pittigzoete sneker zoethoudertjes'. Jochum's favorite soccer team, SNEVO, was losing left and right. The man responsible for soccer club's canteen asked Jochum if he could make a special licorice to calm the team down. The licorice was so delicious many fans missed the first goal SNEVO were able to make in years.

## 1. Echte mildzoute hindeloper ruitjesdrop

First up, we tried the 'Echte mildzoute hindeloper ruitjesdrop'. Try repeating that 10 times as quickly as you can. This mildly salty licorice scored great all around, except for Jente who

did not like it, although she admitted it might be due to a burned tongue. Comments included: 'Nice and salty, goei'n handel.'

*'Tastes horrible at first, but when you bite into it, it tastes like heaven. A salty heaven!' and 'NOICE'.*



## 2. Straffe salmiak parkeerwachters

Results were a bit more divisive with the 'Straffe salmiak parkeerwachters', failing according to one members, while receiving high praise from others. This was the only non-Oldtimers licorice we tried and it achieved a respectable number 2 place on the overall scores. Jente refused trying this one, which is why she did not submit a score. 'Just droppish', 'Feeling more Dutch by the minute' and 'what flavor there is I like, but I want more!' were some of the comments by the committee.



## 3. Echte pittigzoete sneker zoethoudertjes

This one perhaps divided our committee the most, as no grades between 6 and 8 were given. Either members loved it (8 and above) or hated it (6 and below). It was the favorite for 4 members, while 3 members voted it their least liked flavor. Diana, who rated this the lowest said: 'Ewwww, it's like biting into wood, don't try it!' while Jasper, who rated this the highest said: 'This is the best one, easily my favorite.'



## 4. Echte volzoete scheepsknopen drop

Last and everything but least, we tried the scheepsknopen drop.

This was by far the best flavor, scoring high grade across the board. Jonah nearly lost his mind when we finally got to this one, because he loves this flavor so much. To put it in his own words: 'This one touches my heart.' Interestingly Meiske completely disagreed, stating:

*'To tough for me, I like them softer.' Which is the effect this flavor had on Jonah.*





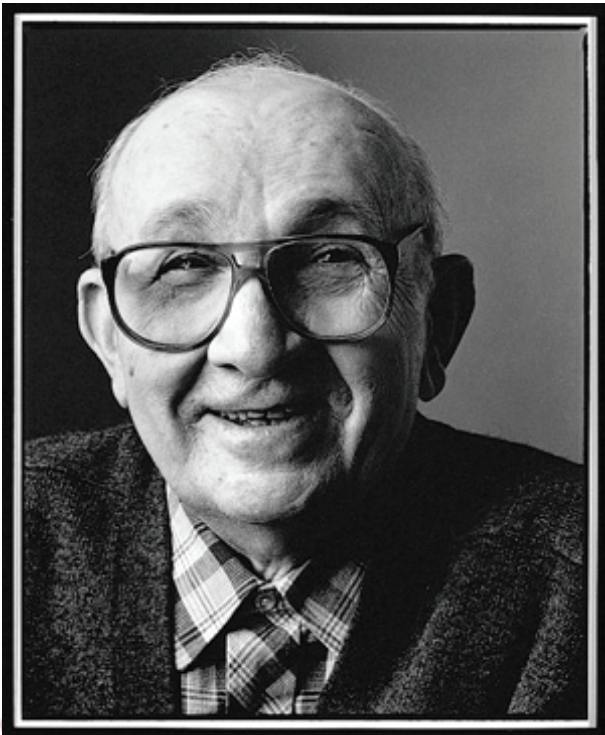
# Conclusion

The flavors tested in this review brought about quite some stir within the committee. We had quite extensive discussions about which ones were the best, which should not be repeated on paper so I will refrain from quoting those discussions here. While the ‘Echte volzoete scheepsknoppen’ won this edition quite easily, all four flavors scored decently, meaning you could try any one of

these yourselves. Although Dana was afraid she wouldn’t like any of them, potentially because they don’t make any tasty licorice in Ireland, she enjoyed all four flavors. Nadia commented that she really hated how the licorice would get stuck between your teeth, which could explain the lower grades she gave. Overall it is quite clear Jasper and Devi just really like licorice, while Jente seems to not like it as much.

					Average
Meiske	6,5	8	8	5	6,9
Jente	4	x	6	9	5,8
Devi	8,5	7,5	9,4	8,7	8,5
Jasper	8	8,9	9,5	8	8,6
Dana	7	8,5	9	6,5	7,85
Nadia	7,5	5	4	7	5,9
Diana	7	8	3	9	6,8
Jonah	7	6	5	10	7
Average	6,94	7,42	6,74	7,9	

“The original Oldtimers licorice were invented by Douwe Douwenga, a licorice maker for the Van Slooten firm. Douwenga first came up with the idea for the ‘Echte mildzoute Hindelooper ruitjesdrop’ in 1924.”





# BAS EN Z'N BEESTJES

*Beasts by Bas*



By Bas van Boekholt

Primates come in all shapes and sizes. From the tiny Pygmy marmoset to the massive Western lowland gorilla. However, there are some things that unite all these wonderful creatures, such as having a thumb. This thumb is not always opposable like ours, but the first finger of the hand does always have a special place, even in primates. But of course, there has to be an exception to this “rule of thumb”. There is one primate that stands out in this, not because it has a weird thumb or has one in a special place, but because this primate has no thumb at all! All that is left of this extraordinary finger is a little stump. For this “Bas en zijn beestjes” I will introduce you to the wonderful hands of the Black-and-white colobus.



The Black-and-white colobuses (*Colobus*) are a genus of Old World monkeys consisting of 5 species. The word colobus derives from the Greek word “kolobós” which means docked or mutilated. This of course refers to their thumbs or rather the lack thereof. It is not clear why or how the (d)evolution of their hand occurred or what favoured a thumbless hand. One thing is clear, it does not impede their movement at all. Colobus monkeys are highly arboreal and rarely come down from trees. To get from tree to tree they can make tremendous leaps. A mother with a baby can jump over 7.5 metres. For a human this would be equal to a jump of over 15 metres from a standing position while carrying a weight of 11 kilograms.

Furthermore these monkeys are truly beautiful. The name gives it away that these monkeys are all black and white with the exception of the Black colobus (*Colobus satanus*) which is completely black. At birth, colobus babies are completely white but soon change their fur to that of an adult. The best-known species is the mantled guereza (*Colobus guereza*) which has a long silky veil of white fur on both of its flanks and a long white brush as a tail. Some people believe that they use these long hairs as a parachute when during their long leaps.

Colobuses spend a large part of their day feeding on leaves, fruits and twigs. Since these are low in nutritional value, they have to eat loads, approximately half their bodyweight each day! To extract as much nutrition from their diet as possible these monkeys have a multi-chambered stomach. The downside of this digestion is that it also creates a lot of gas. The monkeys cleverly use this gas in the form burps that are considered a friendly gesture. Maybe something you can try on your next family dinner. The red colobus monkeys in Zanzibar (*Ptilinopus kirkii*) face another dietary problem. The Indian mango leaves, which are the main component of their diet, contain toxins which have adverse effects. They are actually poisoning themselves by eating these leaves. Luckily, these smart monkeys have found a cure. They eat charcoal to absorb the toxins. Finally, there is the mantled guereza which has the strangest of diets since they occasionally like to eat concrete! Nobody really knows why they do this.

Because of their arboreality local people nicknamed these monkeys “messengers of god”. When you see these monkeys swinging from tree to tree with their specially formed hand you can easily imagine them as a modern Hermes. Colobus monkeys form one of these species which are perfectly adapted to their environment and niche. These species make you almost reconsider intelligent design. With this place in my hall of fame, I want to give these monkeys a sincere metaphorical thumbs up!





# Een scherp oog!

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een beter leven te geven. Omdat je tijdens het  
onderzoek veel tijd hebt voor jezelf of omdat  
je een leuke vergoeding ontvangt. Belangrijk  
werk, mooie verdienste.

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studeren en tegelijk  
ook wat verdien

[geneesmiddelenonderzoek.nl/student](http://geneesmiddelenonderzoek.nl/student)



# IDUZZLE...



By Dolan Kekboi

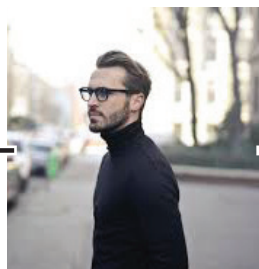


W+



B=J, -A

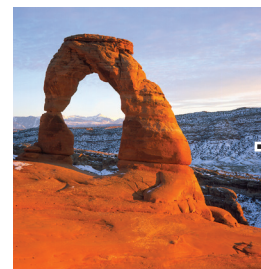
Dieresis on the vowel



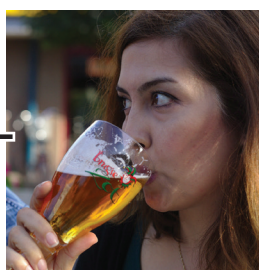
A=U



G+, +R



M=N



P=S



-G, -L



-D



H=E, +S



-T



J=T



T=G



-P

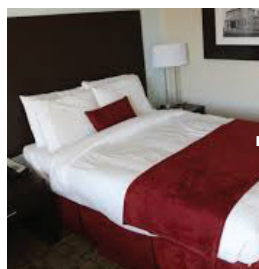


-C

Dieresis on the vowel



H=W



-D



B=G

**Additional challenge:**

Can you find the hidden can of Klok beer?



The previous Iduzzle was won by **Marianne Molenaar**. Congratulations! She has won a marvelous prize, which she is very happy with! Would you like to be mentioned here in the next Lifeline? Please submit your answer to the Iduzzle to [redactie@idun.nl](mailto:redactie@idun.nl) before October 2<sup>nd</sup>.

**Answer to iduzzle 55:** The human ban on bonne glove love was cause for uproar. This bliss sparks dark art hearts no more.