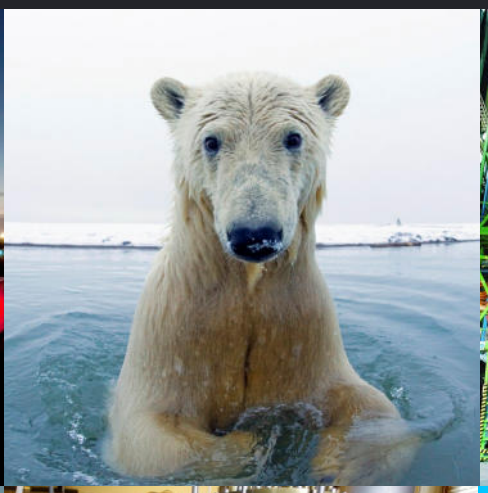
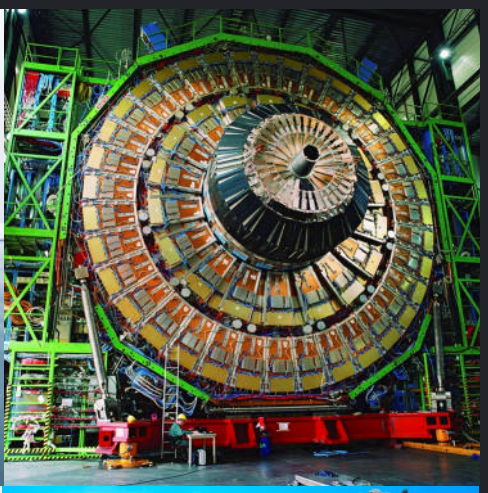
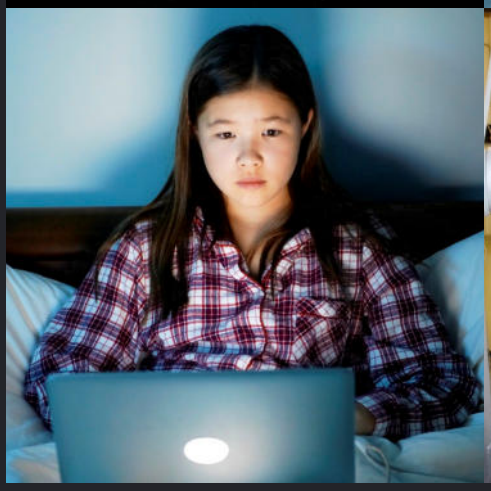
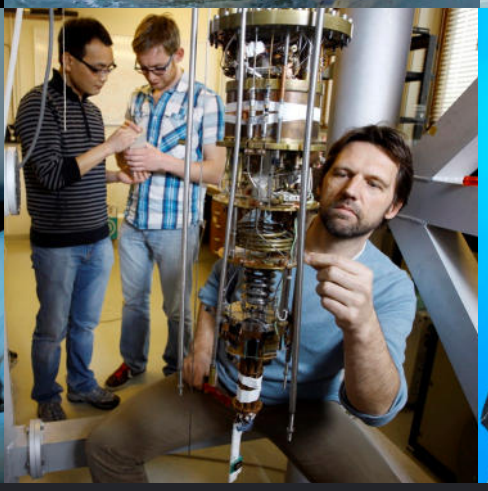
EXPERIMENT NL

SCIENCE IN THE NETHERLANDS


DOES ARTIFICAL LIGHT CONFUSE NATURE? HOW TO INVESTIGATE BLACK HOLES **THE MYSTERY OF FERDINAND BOL** CITIZENS ARE NOT STRICTER THAN JUDGES **ONE DAY NUCLEAR FUSION WILL PROVIDE ENERGY** HOW CAR AND DRIVER CAN COLLABORATE

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NWO

Nederlandse Organisatie voor Wetenschappelijk Onderzoek

Knowledge society

As *Quest* readers know, Dutch science is full of fascinating and exceptionally good research. *Quest* publishes examples of this each month. Every year Quest and NWO (the Netherlands Organisation for Scientific Research, the largest independent research council in the Netherlands) jointly publish *Experiment NL*, which is completely dedicated to scientific research and researchers in the Netherlands.

This is a natural collaboration: NWO ensures that the best scientific research is funded and *Quest* ensures that knowledge is also spread outside the walls of universities and research institutes. *Experiment NL* aims to engage a broad public because science has fantastic stories to tell.

Scientific research covers almost every conceivable subject and each and every day researchers in the Netherlands are busy pushing back the boundaries of our knowledge. And society and the economy thrive on knowledge and innovation generated by this research. NWO supports the entire spectrum of scientific research and so this magazine covers most scientific disciplines.

How can scientists solve mysteries surrounding 17th-century paintings? How can a new intestine develop from just a single stem cell? What sort of strategies do children use to protect themselves from cyberbullying, and how can you help them in that? How can you make a computer chip do several smart things at once? What happened just after the Big Bang?

I expect you will enjoy this magazine. And by reading a magazine like this we can all benefit from science. Our goal is for the Netherlands to become a knowledge society. And we are well on the way to achieving that as a leading nation in international science.

Prof. Jos Engelen
Chair NWO

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'Thanks to the Vidi grant I can do fundamental research.'

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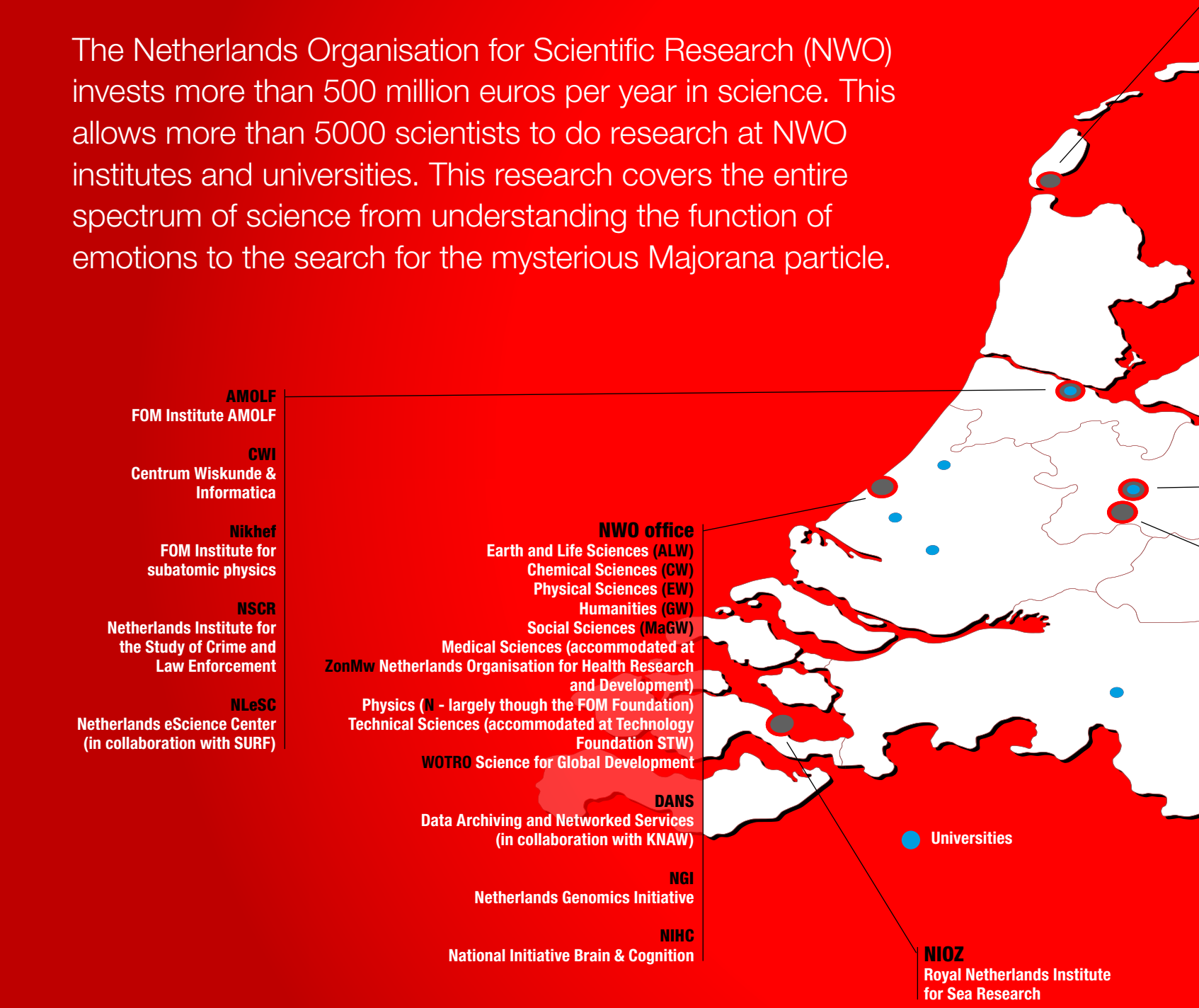
In Kingston, Jamaica, criminals have taken over the government's role. How bad is that for the people?

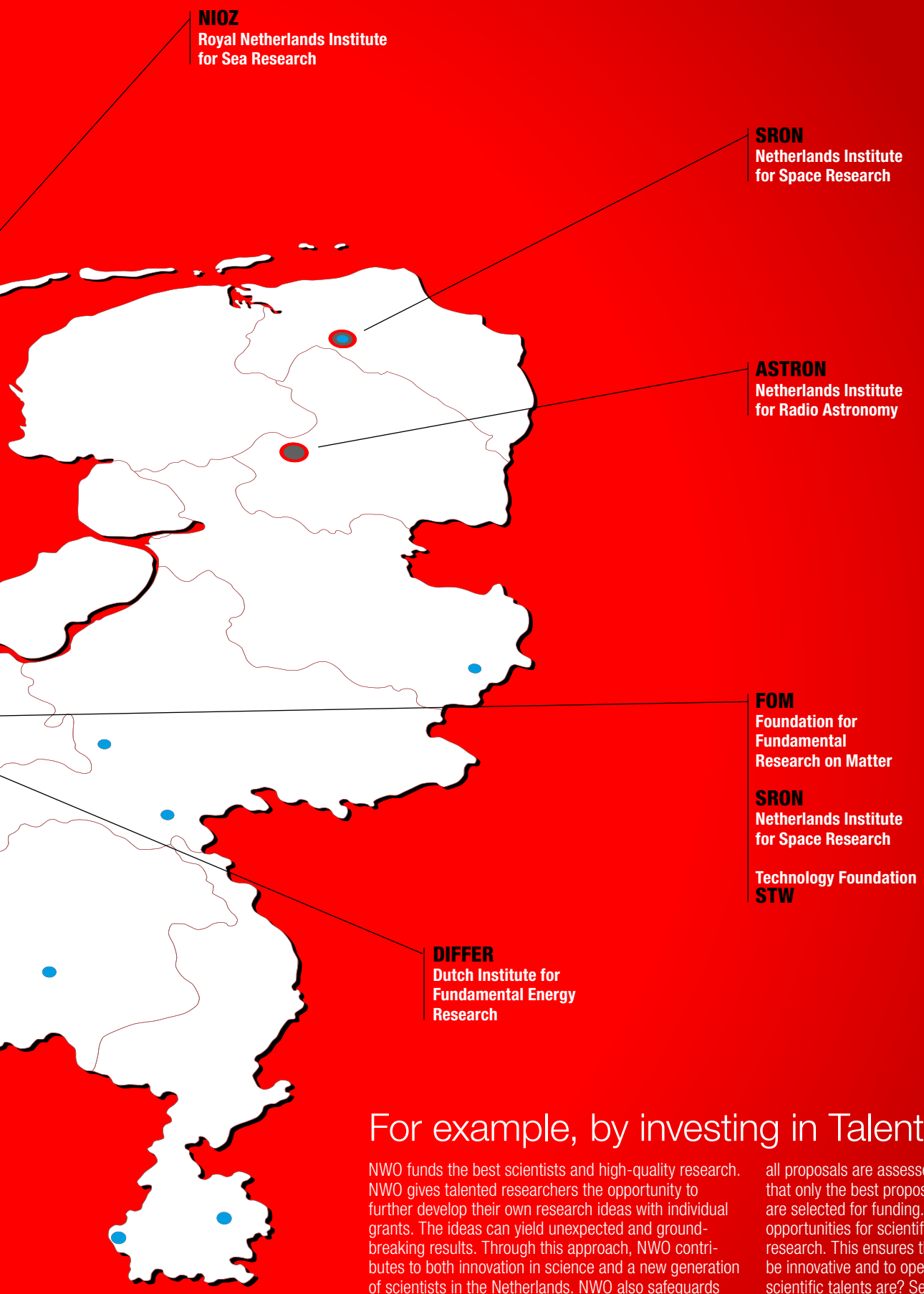
ALSO IN EXPERIMENT NL

NWO funds a wide spectrum of research

About NWO

The Netherlands Organisation for Scientific Research (NWO) invests more than 500 million euros per year in science. This allows more than 5000 scientists to do research at NWO institutes and universities. This research covers the entire spectrum of science from understanding the function of emotions to the search for the mysterious Majorana particle.





For example, by investing in Talent

NWO funds the best scientists and high-quality research. NWO gives talented researchers the opportunity to further develop their own research ideas with individual grants. The ideas can yield unexpected and ground-breaking results. Through this approach, NWO contributes to both innovation in science and a new generation of scientists in the Netherlands. NWO also safeguards the quality of Dutch scientific research by ensuring that all proposals are assessed by international experts, and that only the best proposals from the best researchers are selected for funding. NWO seeks to provide enough opportunities for scientific talent curiosity-driven research. This ensures that Dutch science continues to be innovative and to operate at a world level. Who these scientific talents are? Several of them will be introduced to you as you read this magazine.

Oceans and polar ice as predictors

The state of the climate

The earth is heating up and that has consequences for nature, the environment and our own safety. Predicting exactly what these consequences are is difficult. Researchers are therefore investigating oceans and polar ice to improve our climate models.

TEXT: FLOOR VAN DEN HOUT

Our winters are mild thanks to the Gulf of Mexico

NIOZ researchers examine a drill core. You can also obtain information about the climate from coral.

Fancy a game of 'Bother the climate scientist'? Then ask him or her why it was such a bad spring last year. If the earth is warming up then how could that happen? Professionally speaking, climate scientists have nothing to do with the short-term weather. They are interested in large numbers and long timeframes. The spring of 2012 might have been wet and cold. However, if you compare springs since the 1990s versus springs 100 years ago then it is clear the climate is changing. Yet global warming does not automatically mean it is getting warmer everywhere. Pleasant locations now might be icy cold in the future. Much of the Netherlands is under sea level and so should it start evacuating its citizens now in view of the rising sea levels? Or will the sea level around the Netherlands fall? The consequences of climate change are still far from clear. Major interests are at stake, however, and so scientists throughout the world are doing their best to improve the accuracy of predictive models. Dutch researchers are also looking for pieces of the climate puzzle: some are examining climate changes in the past and others are studying our current climate in greater detail.

Gulf Stream is a good thing

'Look, this is what it's all about,' says Will de Ruijter, Professor of Physical Oceanography at Utrecht University. The map of the world on the table is covered with red and blue streamers that show the ocean currents, enormous quantities of cold or warm water that rotate their way through the rest of the oceans. 'The oceans compensate for how the sun heats up the earth unequally, by bringing the warm water to the cold regions in the high North and deep South and transporting cold water back to the equator.' Ocean currents arise when two parts of the ocean differ in height, water pressure, temperature or salt content. Then the water automatically flows from one location to the other, explains De Ruijter. 'For example, in Europe we benefit from the Gulf Stream. This starts in the warm Gulf of Mexico where much water evaporates. The salt does not evaporate, however, and so the ocean water becomes saltier, and therefore heavier, and flows north eastwards. Warm water also results in a higher land temperature. The Netherlands therefore has quite a pleasant climate throughout the year, whereas just as far north on the other side of the ocean, in Canada, winters can be bitterly cold.

The sea level is rising yes/no*

Greenland's ice caps are melting and that is not just bad news for polar bears. The molten ice ends up in the Atlantic Ocean just around the corner from the Netherlands. So should we start evacuating the West of the Netherlands that is mostly under sea level? NIOZ director Henk Brinkhuis says we should not worry too much about the ice from Greenland, as the melting South Pole is a bigger threat. 'Although you might think that water is spread evenly across the oceans, height differences of more than 100 meters above or below sea level exist. This is because all masses also have an attractive force and so large continents attract more water than small islands. When the ice on Greenland melts the island loses mass and so some of its attractive force. The sea level within a radius of about 2200 km of Greenland will therefore fall. (Somewhere else the sea level can rise.) When ice on Antarctica melts the opposite happens. Then the South Pole exerts less attractive force on the water and so this flows to the Northern Hemisphere.'

*Cross out what is not applicable

Coral whisperer predicts rain

Oceanographer Craig Grove gained his PhD from the VU University Amsterdam in 2012 for his research into how corals can reveal climate history.

Can corals tell us something about the history of climate?
'Yes, corals store important climate information in their calcium skeletons. They absorb substances from their surroundings into their skeleton and grow about 1 cm per year. During heavy periods of rain, more soil is washed into the sea and these soil particles are found in the coral.'

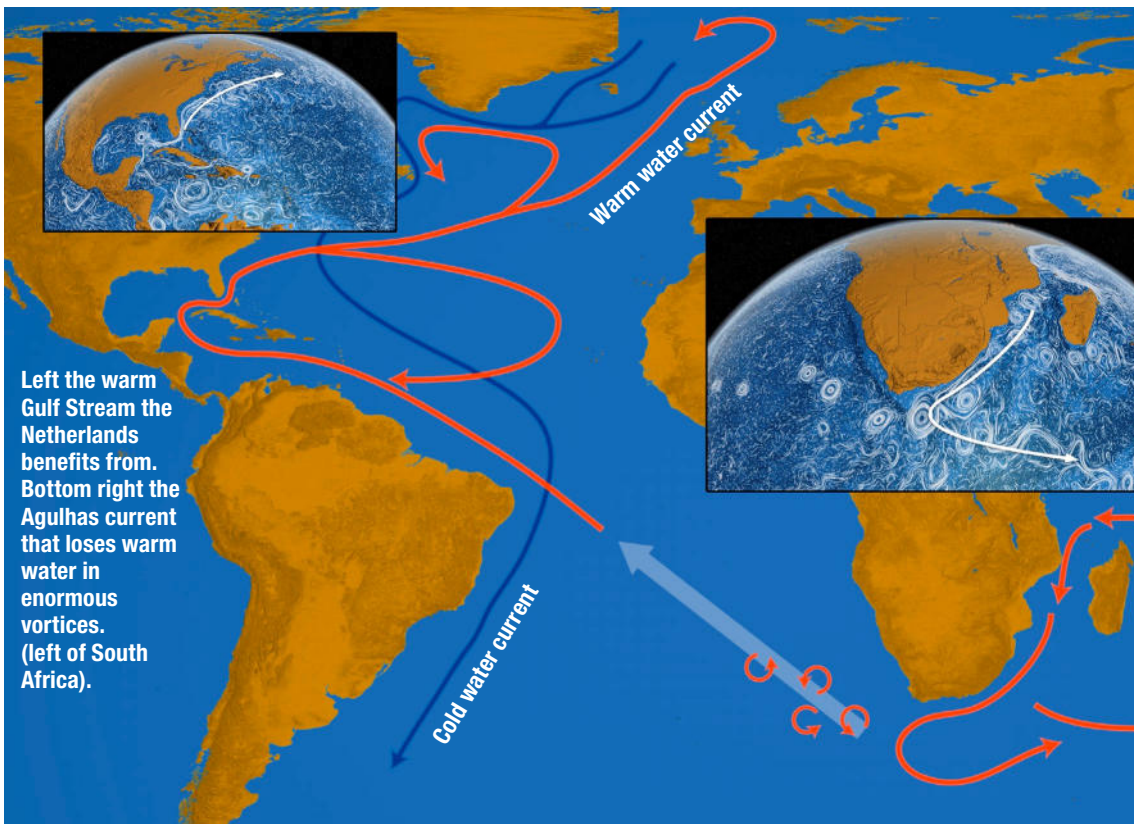
How can you see the soil particles?
Using a specially developed scanning technique you can illuminate the coral skeleton using UV light and map the soil particles.'

Why is information about soil particles and rain useful?
'I used corals to investigate how much rain has fallen in East Madagascar over the past 300 years. This amount correlated with the water temperature in the Pacific Ocean, thousands of kilometres away. The colder the water in the central Pacific Ocean triggered more rain that fell on East Madagascar.'

And is that interesting?
'Yes, because understanding the correlation between ocean temperatures and rain is important for determining future precipitation patterns. More rain on East Madagascar could mean less rain on the southeast coast of mainland Africa. In areas with a limited water supply, knowing whether a dry or wet period can be expected is useful and you can find that out by monitoring the temperature of the Pacific Ocean.'

Conveyor belt leaks

The conveyor belt of warm and cold water influences the climate and appears to be clear and stable on the map. Appearances can fool, however, because ocean currents are highly complex. And according to De Ruijter there is one location where this influence has been underestimated up until now: a 'leak' in the Agulhas current near South Africa. The Agulhas current transports warm water from the Indian Ocean along the east coast of Africa. When the current reaches the tip of the continent, most of the water reverses and flows towards the Indian Ocean. Some, however ends up in vortices up to 300 km wide. These vortices contain warm water that instead of reversing, 'leaks' down to the colder Atlantic Ocean. The Agulhas 'leak' is nothing new but several years ago De Ruijter and his colleagues discovered variations in the Indian Ocean affect this leak. 'We saw there at the speed of ▶



Left the warm Gulf Stream the Netherlands benefits from. Bottom right the Agulhas current that loses warm water in enormous vortices. (left of South Africa).

Palm trees once grew on the South Pole

the current in the Indian Ocean strongly influences the number of vortices and amount of water leaking away. The faster the current the more water leaks away. Considerable quantities of warm water end up in the Gulf Stream and so influence the temperature in Western Europe as well. Our discovery that the Agulhas current so strongly influences the climate thousands of kilometres away is quite fundamental, and cannot be ignored in climate models.'

Greenhouse effect is not unique

Henk Brinkhuis has a completely different approach. Just like De Ruijter he crosses oceans to the other side of the world. But then he investigates the distant past rather than the present. Brinkhuis is director of the Royal Netherlands Institute for Sea Research (NIOZ) and a paleoceanographer, somebody who studies how the oceans have changed over time. 'Many people think the current rise in temperature and carbon dioxide levels is unique. Yet over 50 million years ago, an even more extreme greenhouse effect occurred on the earth. So to discover how nature might respond to the current conditions you would be wise to study how the fauna and flora on earth adapted back then.' Brinkhuis travelled to the South Pole for his research during the Antarctic summer of 2010. There he used an enormous drill to bore 1 km into the ground. That brought a geological history book back to the surface. 'I do not mean a real book. However, the stratified soil sample reads like a book as the earth is continually accumulating layers of dust, sand and sludge. The deeper you go the older the layer. These layers contain plant remains and plants have a strict temperature range. So if you discover tropical plant remains, you know it was not freezing then. Palm trees on the South Pole seem implausible now. However, in the layer from 54 to 52 million years ago we found pollen grains from the baobab tree, tree ferns and tropical fruit and nut trees. In such a prehistoric tropical rainforest the winter temperature did not drop below 10°C. That is quite amazing as it is pitch black at the South Pole during the winter.'

Sleeping on Antarctica

Similar research demonstrated it was extremely warm in the Northern Hemisphere at this time. Of course the

Plankton grabs its chance

Anna de Kluijver is a marine biologist. For her PhD research at the Royal Netherlands Institute of Sea Research she placed 17 metres tall test tubes in the ocean near Spitsbergen.

Why Spitsbergen and not a warm location?
'I investigate the consequences of ocean acidification. CO_2 dissolves easier at low temperatures and so the polar seas are more vulnerable to acidification than warmer waters.'

Why did you use this test tubes?
'It is difficult to simulate the ocean in the lab and very hard to manipulate things in the ocean. I therefore created 'mesocosms'. These are clearly defined bits of ocean where the conditions are natural but controllable.'

What did you manipulate?
'These mesocosms all received a different quantity of CO_2 to simulate the sea from now until that of the middle of the next century.'

What do you want to know exactly?
'How acidification affects the food web. Acidification sounds bad but it can provide opportunities for plankton, for example. Plankton are the miniscule plants and animals that swirl around in the water. Plant-like plankton are eaten by animal-like plankton which in turn serve as food for small fish and other marine animals. Plankton are therefore a link in the food web. Plant-like plankton survive by converting CO_2 into oxygen. An acidified ocean can therefore mean more plant-like plankton and so more food for higher organisms.'

And what are the effects of acidification?
'Unfortunately science does not work that fast.'

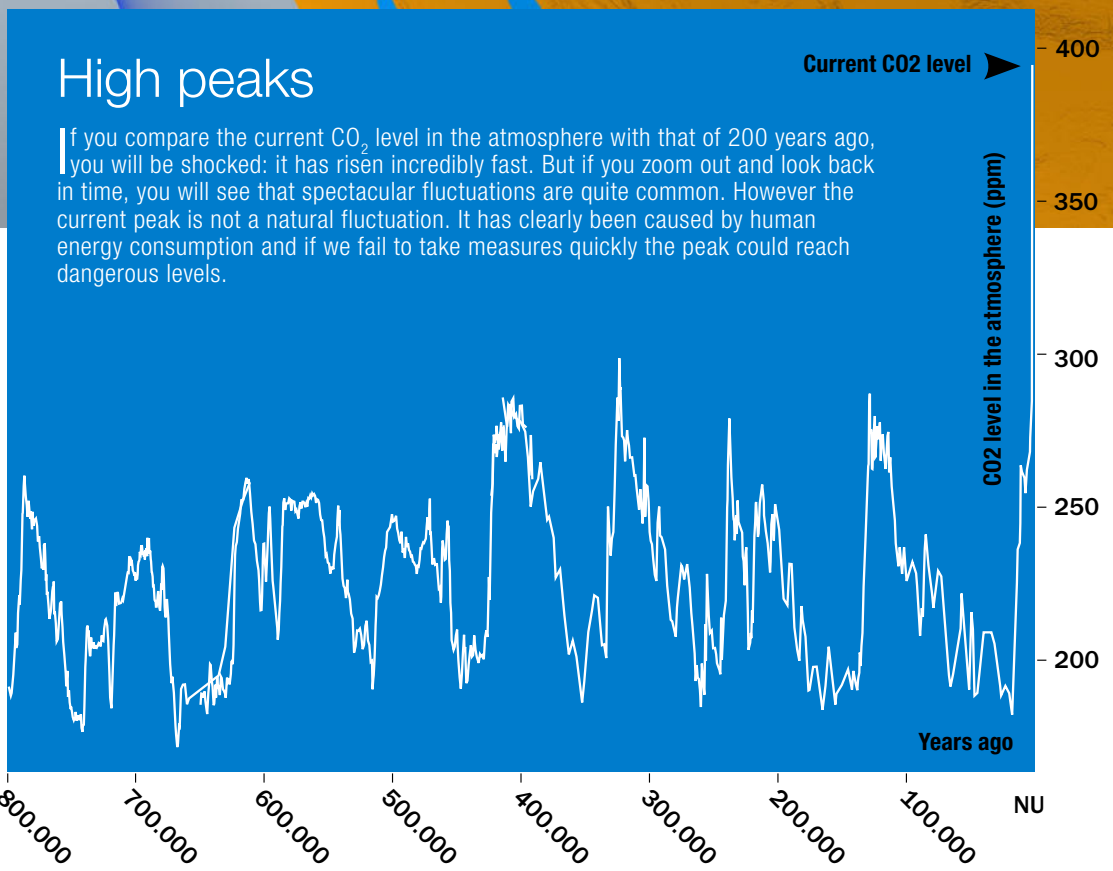
Laboratories in the ocean: mesocosms.

How does that work?

It is our fault the earth is warming up. Because for the past few decades, on a geological scale just a twinkling of the eye, we have used huge quantities of fossil fuels. Combusting all that oil, gas and coal releases carbon dioxide (CO_2) that remains hanging in the atmosphere as an invisible gas layer. This layer works just like the glass in a greenhouse roof: the heat cannot escape and so the temperature rises.

High peaks

If you compare the current CO_2 level in the atmosphere with that of 200 years ago, you will be shocked: it has risen incredibly fast. But if you zoom out and look back in time, you will see that spectacular fluctuations are quite common. However the current peak is not a natural fluctuation. It has clearly been caused by human energy consumption and if we fail to take measures quickly the peak could reach dangerous levels.



question is: what do these studies mean for our climate? Can we sleep at the Poles in our hammock in the future? Brinkhuis: 'These drill cores reveal what happens if extreme quantities of carbon dioxide enter the atmosphere. The CO_2 level back then was 5 to 7 times higher than it is now and so a palm beach on Antarctica is still a long way off. On the other hand, we still benefit from the buffer effect of the oceans absorbing much of the greenhouse gases. If the oceans become saturated, the carbon dioxide level in the atmosphere will rise far faster than now. As there is a direct relationship between carbon dioxide and temperature it could suddenly become warmer than we now expect. Research into the warm water leak near South Africa and the earth's response to the CO_2 rise millions of years ago are just two insights into how the climate functions. But many more researchers throughout the world are hard at work. Climate models are more complete and predictions about long-term changes are becoming more accurate. The same applies to the weather. But remember not to bother the climate scientists about that. ■

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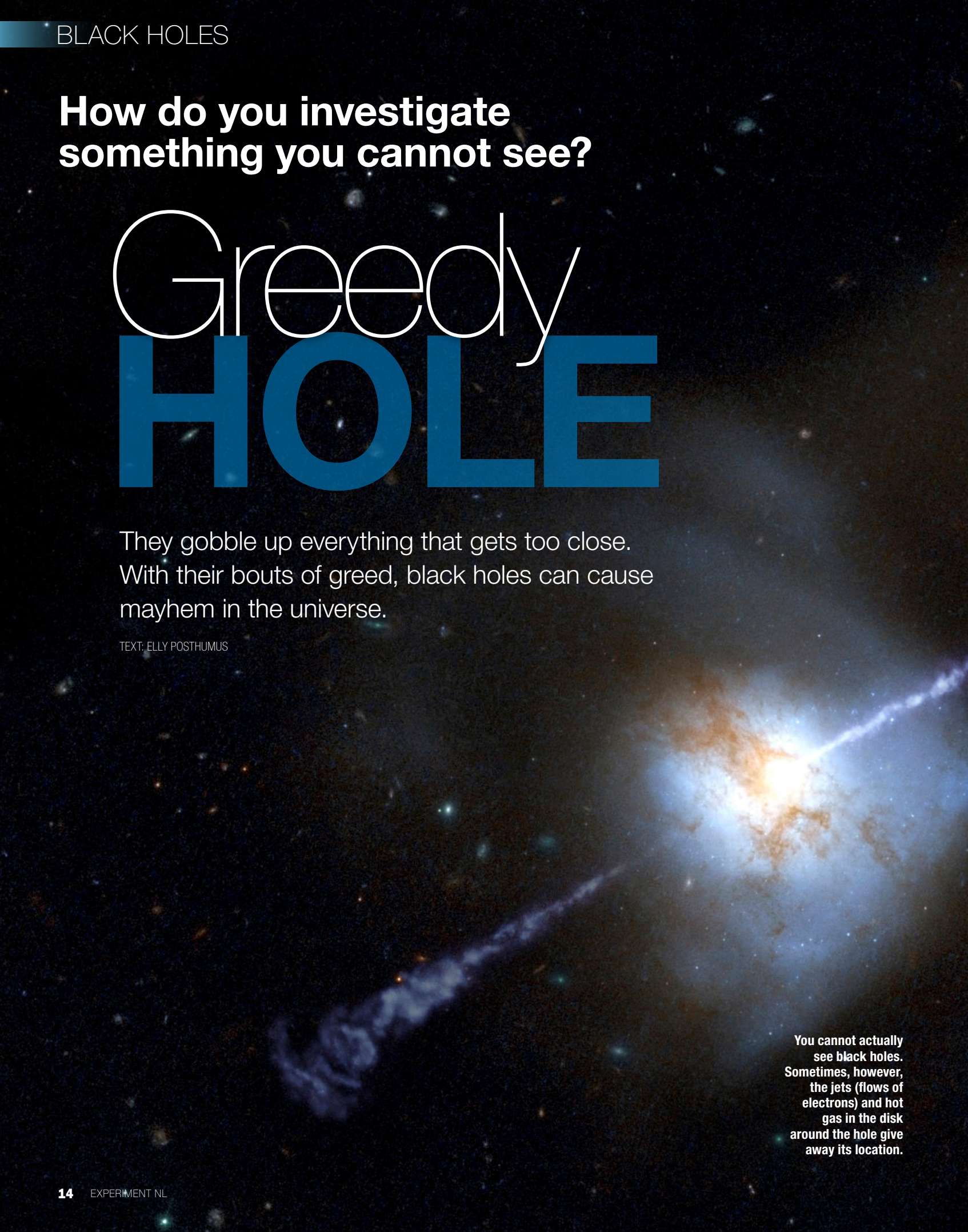
How do you investigate something you cannot see?

Greedy HOLE

They gobble up everything that gets too close. With their bouts of greed, black holes can cause mayhem in the universe.

TEXT: ELLY POSTHUMUS



You cannot actually see black holes. Sometimes, however, the jets (flows of electrons) and hot gas in the disk around the hole give away its location.

Nothing can escape from one. The universe is full of them, and yet nobody has ever seen a black hole. Why? Because they are invisible. What is a black hole really like? How do these large greedy holes in the universe evolve? How do we know they exist if we cannot see them? And how do they influence galaxies?

Star is finite

Each star has a finite life. At the end of their lives, superheavy stars turn into black holes. 'Each star is the product of gravity trying to pull the star inwards and a force in the star preventing that,' explains Peter Jonker, an astronomer at space research institute SRON in Utrecht. An incredible amount of energy is needed to resist the force of gravity and that comes from the fuel the star uses in its core. When that fuel runs out the star no longer has the energy to resist the force of its own gravity and so it collapses. A star only collapses completely if its mass, and therefore its gravity, is large enough. Such a star becomes far smaller but remains almost as heavy. Jonker: 'According to some theories the outer layers fly away during an explosion, whereas in other models the star keeps all of the mass.' But whichever theory is correct, the remaining mass in an imploding star is squeezed into an infinitely small space by gravity: a black hole is born.

Black is invisible

The gravity in such a concentrated amount of mass is enormous and so anything that gets close enough to the compressed star can no longer escape its iron grip. You need a certain speed to escape the gravity of an object, such as a planet ▶

A black hole is invisible because light cannot leave it.

Glimpse into the past

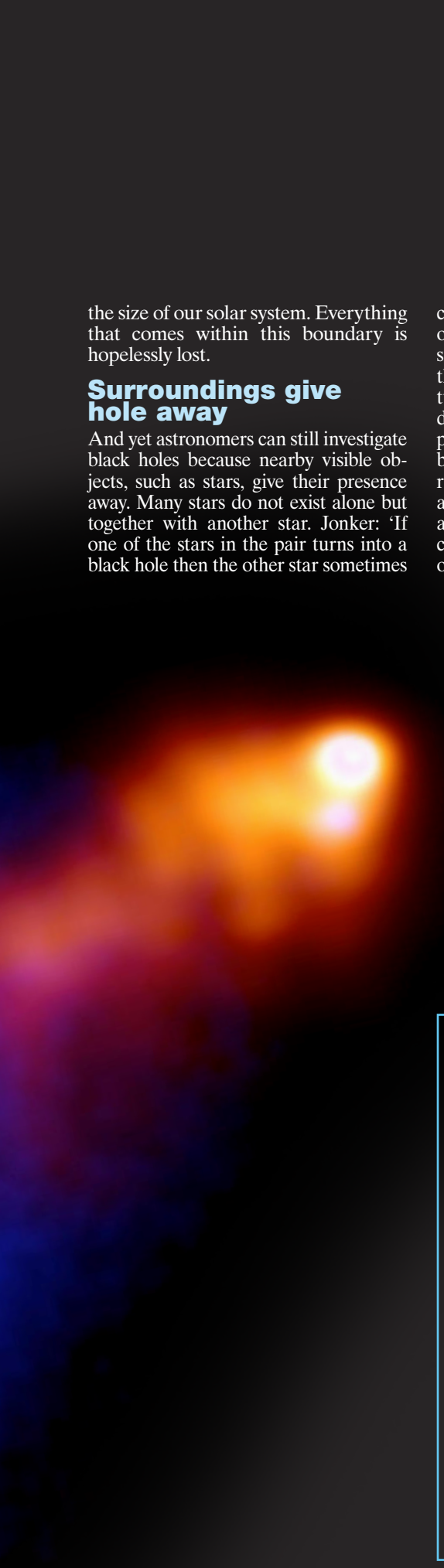
To see a distant object in the universe in detail you need an enormous telescope, one preferably as big as the earth. The Low Frequency Array (LOFAR) radio telescope of the Netherlands Institute for Radio Astronomy (ASTRON) is a step in the right direction. It consists of a very large number of antennae instead of a single large dish. These antennae are spread over different stations throughout Europe and the signals from them are added up to create an enormous digital telescope that allows you to look incredibly deep into the universe. The greatest distance between two stations is now about 1500 km but in the future the telescope can be expanded even further. LOFAR's antennae pick up radio waves, 'light' with a long wavelength. This radiation can pass unhindered through almost anything. Detecting this radiation allows you to look deep into the universe, where you can see radiation transmitted billions of years ago.

▶ or a star. The size of this 'escape velocity' depends on the mass and radius of the object. The more massive the planet the bigger the gravitational force and so the higher the escape velocity you need. On the moon, 2.38 kilometres per second suffices. On the earth you need 11.2 kilometres per second. And on the sun you need about 600 kilometres per second. Jonker: 'However, the gravity, and so the escape velocity you need, also depends on how far you are from the core.' Close to the core the gravitational force is stronger and so you need a higher escape velocity. Due to its enormous mass and small volume the gravity of a black hole is so great that within a certain radius nothing can escape. Even the highest possible speed, light at 300,000 kilometres per second, is not enough to escape. As light cannot escape from a black hole we can never see one. The boundary at which light can no longer escape is called the event horizon. This varies, depending on the mass of the black hole from 10 km to

the size of our solar system. Everything that comes within this boundary is hopelessly lost.

Surroundings give hole away

And yet astronomers can still investigate black holes because nearby visible objects, such as stars, give their presence away. Many stars do not exist alone but together with another star. Jonker: 'If one of the stars in the pair turns into a black hole then the other star sometimes continues to rotate around it.' The orbit of the remaining star gradually becomes smaller and eventually it gets so close to the black hole that it starts to be disturbed by it. The black hole's gravity draws out matter from the star and these particles do not fall directly into the hole but gradually spiral closer to it. This gives rise to a disc of gas and dust that rotates around the black hole. An enormous amount of energy is released during this circulating fall. 'Due to the friction with other particles in the cloud part of the energy is converted into heat, which is transmitted as radiation.' Just before the matter falls into a black hole, the temperature of this disc is so high that it emits X-rays. Special telescopes can see this radiation. Jonker: 'Not all black holes emit radiation like this and so we can only find the black holes where this does happen.' So black holes that do not 'eat' remain invisible.



Galaxy Cygnus A with a super-massive back hole in the middle (the blue-white dot in the middle). Radio waves caused by the jets are marked in red. Blue marks the gas from the galaxy.

Dust causes growth

Jonker: 'We can 'see' several hundred of these stellar black holes in our own Milky Way. However we think our galaxy must contain about 100 million of them. So we only see a fraction of all black holes that exist.' Most have a mass about 10 times that of the sun, which is relatively small compared to the black hole that is located at the centre of nearly every galaxy. These are super-massive black holes that have a mass several hundred thousand to several tens of billions that of the sun. The hole at the centre of our galaxy is only about four million times the mass of the sun and so relatively small. Super-massive black holes are probably created when galaxies merge. Everything more massive than the average mass sinks to the middle and so the massive black holes from the centres of the different galaxies eventually merge together there. Furthermore all massive holes gain in mass as a result of the dust, gas and stars that they gobble up throughout their existence.

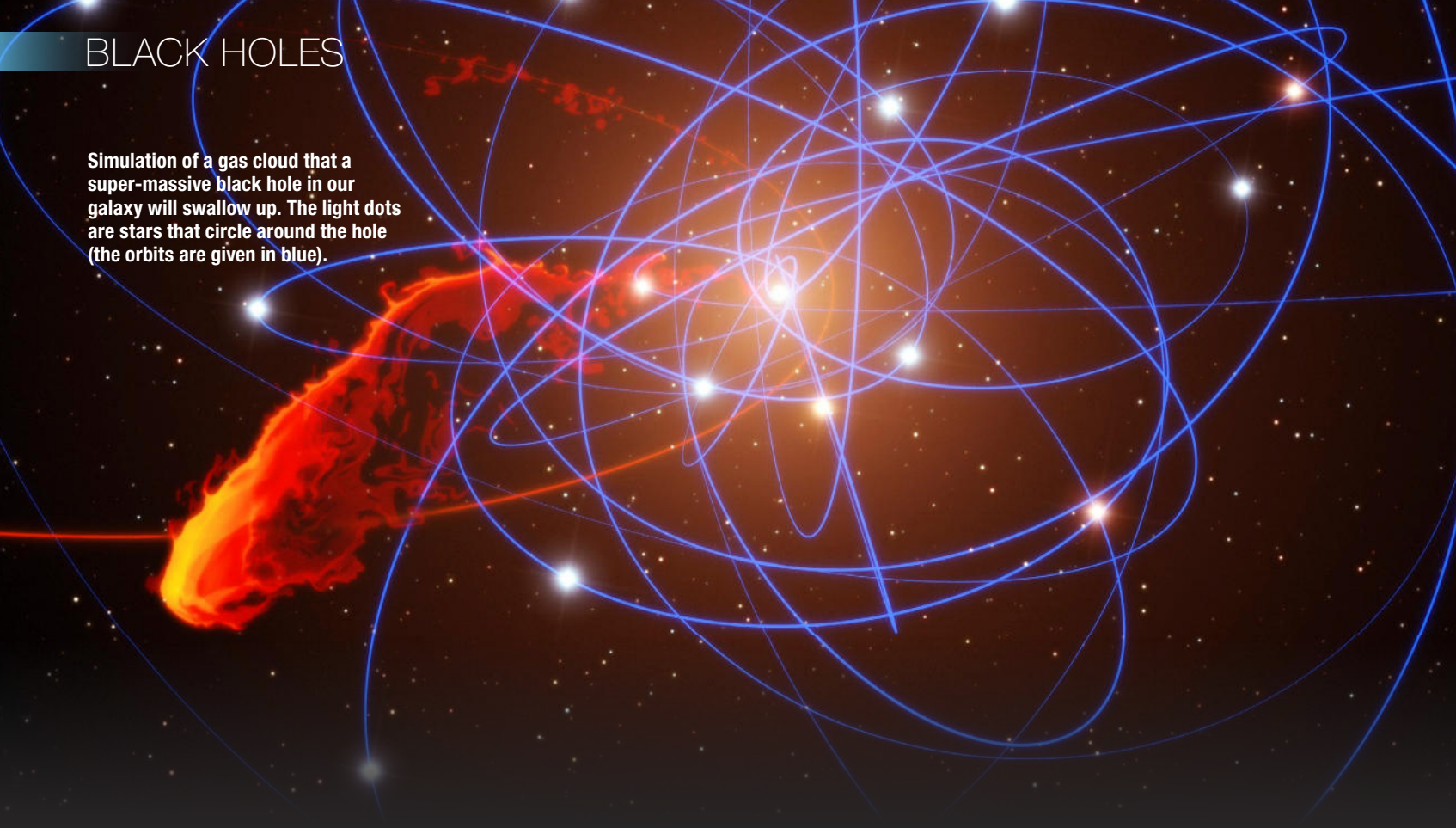
Hole causes jet

Super-sized holes can sometimes be seen. They are given away by the very large jet streams in their immediate vicinity. 'These jet streams consist of electrons moving away from the black hole at almost the speed of light,' says Ilse van Bemmel, astronomer at the Netherlands Institute for Radio Astronomy ASTRON. As these particles slow down they lose energy in the form of radio waves. This type of radiation can be seen with the radio telescope (see the box 'Glimpse in the past'). The black holes where the jets occur are actively gobbling up mass, but they do not swallow everything up. A part is flung away at high speed before it disappears beyond the event horizon. Van Bemmel: 'We still do not know exactly how black holes grow or where the matter comes from. But as we see these jets we know that the black hole is ▶

Holes in numbers

How many? Where can they be found? What does such a thing actually weigh? And more figures about black holes.

- ✶ The closest black hole is about 1600 light years from earth.
- ✶ The super-massive black hole in the centre of our galaxy is located at about 28,000 light years from earth.
- ✶ A new black hole is created somewhere in the universe about once every second.
- ✶ The largest black hole discovered to date is in galaxy NGC 4889 about 308 million light years from earth. It is estimated to have a mass about 21 billion times that of the sun.



Simulation of a gas cloud that a super-massive black hole in our galaxy will swallow up. The light dots are stars that circle around the hole (the orbits are given in blue).

The biggest black hole in our galaxy is staying calm

feeding. This matter can be an individual gas or dust cloud but the gas or dust can also be supplied when an entire galaxy is merging with the galaxy hosting the black hole.' The gas or dust from such an infalling galaxy can form new stars by merging together. However, the matter captured can also end up in the vicinity of the super-massive black hole and cause the jets there.

Jet slows down

Super-massive black holes and their associated galaxy do not endlessly grow. Jets slow down the rate gas and dust fall towards the black hole. 'They can influence an entire galaxy,' says Michael Wise. This astronomer from ASTRON studies super-massive black holes and their jets. 'In the most extreme cases these jets can disrupt an entire galaxy and even blow it apart.' Jet streams have been found to reach far into the universe. They blow through the entire galaxy, and on their journey they push aside the gas between stars. This prevents the formation of new stars and blows away the dust falling in towards the black hole. This decreases the supply of fuel and so the super-massive black hole becomes less active and the jets weaken or disappear. The gas and dust then falls into the black hole again, increasing the activity of the black hole and its jets. Wise: 'It is a sort of cycle. The matter is always trying to fall inwards due to the black hole's gravitational force. Without eruptions, the fuel would fall into the black hole in a continuous stream. These jets provide a counterforce.'

What about the super-massive black hole in our galaxy? 'Fortunately that is not so active, but it could change,' says Van Bemmel. 'That might happen if the Milky Way collides with the nearby Andromeda Galaxy in a few billion years.' Yet we will be long gone by then. And just as well. Van Bemmel: 'If our solar system crossed the path of such a jet, we would not survive for long.' ■

elly.posthumus@quest.nl

Binge around the corner

It will happen in mid-2013. A gas cloud with a mass about three times that of earth will probably then reach the edge of our Milky Way's black hole. The cloud has recently been heading towards the black hole with increasing speed and now has a speed of about 8,000,000 kilometres per hour. It is also being pulled apart. Scientists are extremely curious about what exactly will happen. They have never made a live observation of a gas cloud falling into a black hole and certainly not from so close by. It might, however, take several decades before the cloud disappears into the black hole.

! FURTHER INFORMATION

www.astron.nl: site of the Netherlands Institute for Radio Astronomy
www.sron.nl: site of the Netherlands Institute for Space Research

Virus predictor

Talented scientists with an innovative research plan can obtain funding from NWO. For researchers who have recently gained their PhD there is the Veni grant worth a maximum of 250,000 euros and for more experienced scientists there is the Vidi grant worth 800,000 euros. The Vici, worth 1.5 million euros, is for senior scientists.

Why exactly were you chosen?

'NWO selects candidates who belong to the top ten percent of their discipline. And I am in the top of virology. Then, of course, you must have a genuinely groundbreaking research proposal. With my research, I want to predict the evolution of influenza viruses in humans. That is definitely unique, as nobody has ever predicted evolution before. In retrospect you can say that humans evolved from apes, but nobody knows evolution ahead of time. Viruses have the advantage that they are easier to modify in the laboratory than animals or humans. With viruses you can investigate something in one day that would take ten years in animals. We want to be able to predict fundamental processes of virus evolution several years in advance.'

What are you using the money for?

'I was able to expand the research group I had to study winter flu in humans for five years. That virus continuously changes and so the flu jab has to be updated every few years. That is an expensive and time-consuming process. After three years of research, we now know how the virus escapes the vaccine's effects. We also think that we can predict the evolution, but we will have to wait another five or ten years before we know if our predictions are correct!'
'The human influenza research is similar to research that my colleagues and I did on the avian flu virus H5N1. We managed to mutate that virus into a virus that can be passed on from one human to another. That gave rise to a lot of commotion last year. An American committee initially said it was too dangerous to publish the results. Nevertheless, we were allowed to publish the results in the end as that was in the interest of science.'

How did you end up in this line of work?

'I was always fascinated by small things. I had a microscope as a child and I looked at the exceptionally beautiful wings of flies. Then you want more, even smaller, until you look at bacteria. When I graduated as a microbiologist in 1989 it had just been announced that HIV caused AIDS. I did my PhD research on that virus, which was then the most important subject in virology. Ten years later I was ready to move on and I was offered a position in Rotterdam doing research into the H5N1 virus. It had just become known that people in Hong Kong were dying from the virus and so once again my research was highly relevant.'

What would you still like to investigate?

'Hosts, carriers of viruses, respond very differently to viruses. During the flu epidemic of 2009, some infected children happily went to school whereas others died. That is largely due to the genetic characteristics of the host. Our understanding of that is still limited and so that is what I would like to investigate next.' ■

RON FOUCHIER (45), Professor of Virology at Erasmus MC in Rotterdam, received a Vici in 2008.

Lack of sleep shrinks rat brain

If you watch television into the small hours of the morning, keep on reading in bed or hang around on the Internet until late then you are more likely to develop depression. Neurobiologist Peter Meerlo from the University of Groningen kept rats in wheel-shaped cages that kept on rotating slowly. The animals normally sleep for 10 hours per day, but during the study they only had 4 hours of sleep because the cages stood still for only 4 hours per day. After a month of sleep deprivation Meerlo saw that the hippocampus of the rats had shrunk by ten percent. That part of the brain is important for regulating emotions. Rats in the cages that stood still for 10 hours did not have an abnormality. Previous research had demonstrated that people with depression often have a smaller hippocampus. Disrupted sleep is often seen as a consequence of depression, but Meerlo's study supports the idea that it might be a cause of depression as well.

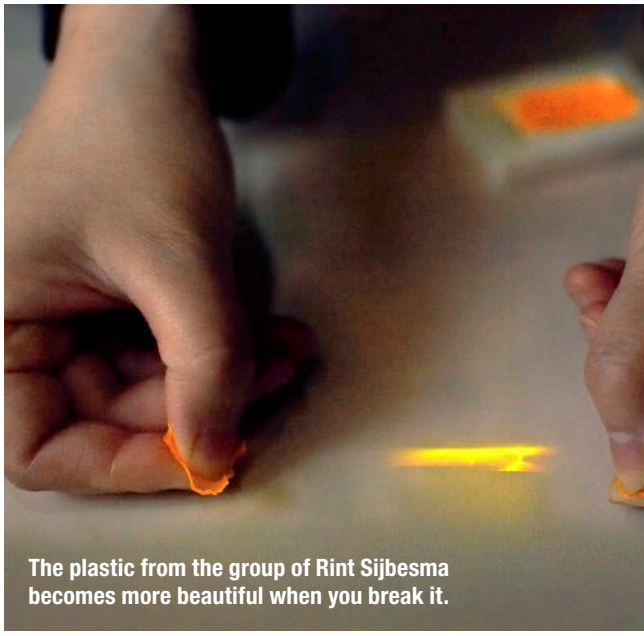
How do you keep a rat awake? By rotating its cage.

Sober? Extravagant!

Dutch fashion has a reputation for being plain and practical. Is it because the Dutch have to cycle whatever the weather? Is it because their long democratic tradition means they do not need to emphasise their status and position through their dress? Or is it because their Calvinistic tradition does not allow them to display their wealth? Is Dutch fashion really that plain and practical? No, discovered Anneke Smelik from the Radboud University Nijmegen during the study 'Dutch Fashion Identity in a Globalised World'. Together with her colleagues, the professor of visual culture analysed Dutch fashion. Of course, the Dutch dress less formally and more pragmatically, she says, but that is only part of the story. 'The Dutch are also playful, rebellious and extravagant. This attitude is reflected in fashion, for example, in the experimental designs of Viktor & Rolf and Iris van Herpen or the colourful creations of Oilily and Cora Kemperman.'

Breaking plastic produces light

How strong is plastic? Scientists want to know exactly how strong, but it is difficult to see how plastic breaks. In aid of this research, chemists from Eindhoven University of Technology have invented a light-emitting plastic that glows when you pull on it. Such a feature could be highly valuable as it starts to emit light when the plastic breaks. The chemists made the plastic by modifying its molecules to include luminescent dioxetane groups. When you pull on the plastic, these groups of atoms break open to emit light. The light-emitting plastic is similar to the glowing rods popular at concerts and children's parties, only those work differently. A glowing rod contains various chemical substances, and if you crack the rod these substances come together and glow as a result of a chemical reaction.



The plastic from the group of Rint Sijbesma becomes more beautiful when you break it.

Designs from Victor & Rolf reveal that not everything Dutch is plain and practical.

Hobbits live in New Zealand of course.

Where does Frodo live?

A Baantjer (Dutch TV police series) tour through Amsterdam or searching for Hobbits in New Zealand. A growing number of people are travelling to locations that have become famous as the backdrop in books, films or television series. But what drives these media tourists?

Cultural heritage researcher Stijn Reijnders from the Erasmus University Rotterdam investigated these hotspots for three years. His conclusion? People want to be a part of the world they know from books or films. They visit the cafes, shops and houses described or walk the same route as characters to scrutinise how well the location matches the descriptions. Reijnders: 'People want to know to what extent their fantasy matches the reality. Our research is a first step in unravelling the human power of imagination. How does it work and what is based on?'

Mussels smother waves

Dunes and dykes obviously help to keep our feet dry. But oysters and mussels also contribute to coastal safety discovered ecologist Jim van Belzen from the NIOZ Royal Netherlands Institute for Sea Research. He measured wave heights and saw that this decreased as a result of mussel beds and oyster reefs. A typical mussel bank is 25 to 75 cm higher than its surroundings and so the sea above such a bank is shallower. The shallower the sea, the earlier waves break and so the coastline is hit less hard. Furthermore, mussel beds and oyster reefs hold onto silt just like dune grass keeps sand together. This leads to less erosion of the coastline and so a lower chance of floods.

Mixed family fairs well

Would you rather have more sons or daughters? Great tits would prefer equal numbers of both. Biologists from the University of Groningen have discovered why. It results in the most grandchildren. How? In a nest with equal numbers of sons and daughters, the chicks have an average size. In a nest with unequal ratios, the sex in the minority is most successful. They are bigger, whereas the others remain smaller. Smaller animals, however, have less reproductive success. 'As a relatively large number of small animals are found in an unequal nest, the parents have fewer grandchildren on average,' says researcher Reinder Radersma. He thinks the difference in size is due to arguments in the nest. Radersma: 'Chicks from the same sex probably argue a lot with each other and compete for food. The energy invested in arguing goes to the cost of their growth.'

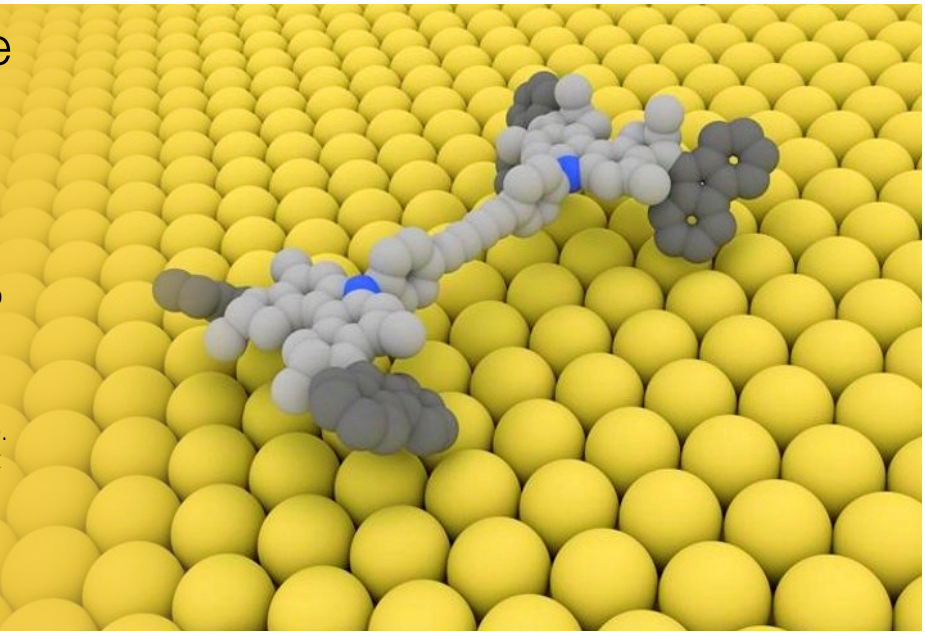
Why the return journey is shorter

Why does the return journey always feel shorter than the outward one? Niels van de Ven from Tilburg University has given the first scientific explanation for this. We are often too optimistic in estimating how long the outward journey takes, so it feels long. Based on this experience, we make an expectation for the return journey: which will probably be long as well. But then it takes shorter than expected. To make this discovery, 360 people were questioned and these included bus users and cyclists. No fewer than three-quarters of the participants experienced the return trip as shorter. People used to think that the return journey seemed shorter because the route was more familiar. This seems unlikely, however, as people who choose a different return route also experience the return journey as shorter.

Nano car really does ride

The smallest car in the world comes from Groningen. Well, if you can call it a car. It is a 4-nanometre long wisp of carbon, hydrogen and nitrogen atoms. This nano car was built by the research group of Ben Feringa, Professor of Organic Chemistry at the University of Groningen. The car's four wheels serve as motors and electrons are added to these using an extremely fine needle. Electrons already present in the engine respond to the new electrons causing the wheels to turn. The team achieved a world first with their tiny moving car. Feringa: 'A nano car previously built in America had to be pushed forwards. So it was more of a cart than a car. Feringa hopes to link other molecules to the nano car in the future. It would then become a sort of a lorry that could transport other molecules.

Ben Feringa's nano car featured on the front cover of the scientific journal *Nature* in November 2011.



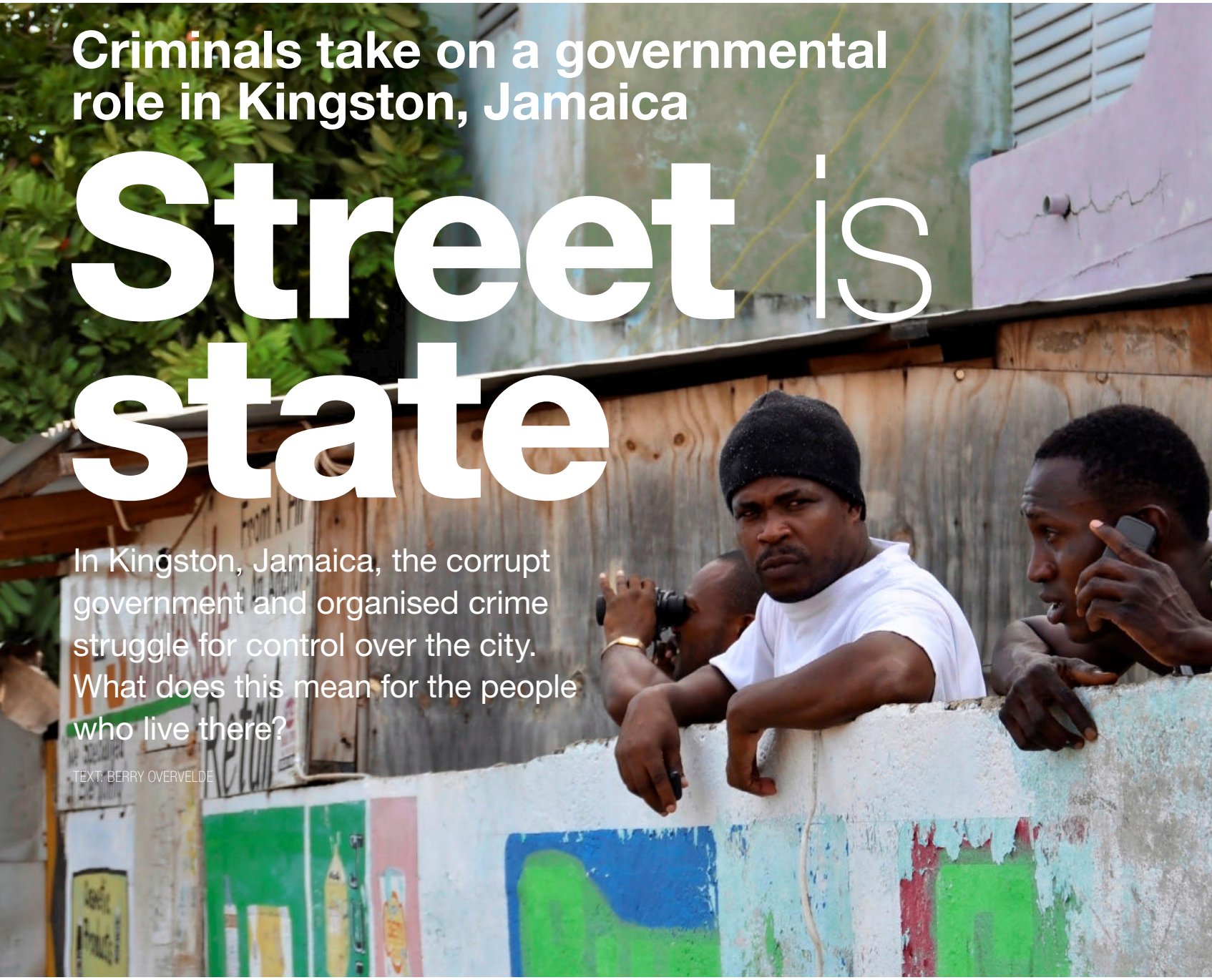
Patients often do not freeze if a doctor is observing them.

Antifreeze for Parkinson's disease

People suffering from Parkinson's disease sometimes 'freeze' while walking. They feel sucked down by earth's magnetic forces. The front of the foot remains on the ground, but the heel hangs in the air. 'Then their legs start to shake,' says neurologist Bas Bloem of Radboud University Medical Centre Nijmegen. His team are looking at where short-circuits occur in the brain at that moment. They placed Parkinson's patients and healthy people in an MRI scanner. As you cannot walk, they asked them to 'think' about walking — and that worked. The Parkinson's patients showed a different activity in the part of the brain stem where walking is initiated. This discovery might lead to a treatment. 'Other groups' says Bloem 'are trying to treat this area with deep brain stimulation. By stimulating the brain stem at exactly the location, we discovered patients might suffer less from freezing.'

Same interrogation, different reports

Is the suspect guilty? The judge's assessment, according to research by Marijke Malsch from the Netherlands Institute for the Study of Crime and Law Enforcement (NSCR), largely depends on which officers write up the written statements of suspects and witnesses. When five detectives wrote a report of the same interview recorded on video, they varied considerably in length and style. Some reports were a monologue from the suspect, others also contained the questions posed. Was the suspect guilty? Of the law students assessed the different reports, 77 percent who read a long report thought the supect guilty, compared to 68 percent who read a short report. Officers who wrote their report as a monologue were thought less biased. Following these results, Malsch is calling for interviews to be recorded on video or audiotape more often. Then the judge can hear and/or watch the entire interview and not just read a written summary.



Criminals take on a governmental role in Kingston, Jamaica

Street is state

In Kingston, Jamaica, the corrupt government and organised crime struggle for control over the city. What does this mean for the people who live there?

TEXT: BERRY OVERVELDE

Downtown Kingston, Jamaica. It’s not so much the government running these inner-city neighbourhoods, but ‘dons’, who lead criminal organisations similar to the Italian Mafia. Until recently, the Jamaican government made few efforts to stop the dons’ rise to power. In fact, politicians collaborated with the criminals and continue to do so. Politicians and criminals helping each other out: what does this mean for the citizens of inner-city Kingston? Over the last few years, Rivke Jaffe, based at Leiden University until 2012 and now working at the University of Amsterdam, has been researching life in the heart of the Jamaican capital. She’s been talking to politicians and residents, as well as criminals. What her research shows is that many people in Kingston are quite supportive of the dons: they offer residents services that the government fails to provide.

Politicians build neighbourhood

Understanding how dons were able to become so powerful requires delving into the history books. ‘Following Jamaica’s independence from Britain in 1962, two political parties have alternated in power,’ Jaffe explains. The JLP (Jamaica Labour Party) devised a strategy to get votes. ‘They constructed a new neighbourhood full of apartment buildings.’ These new homes were allocated to people sympathetic towards the JLP. The distribution of housing units intensified the residents’ support for the party, resulting in loyal JLP neighbourhoods. This in turn meant a guaranteed number of votes during the next election. If they can do that, so can we, was the People’s National Party (PNP) response when they came to power a few years later. And downtown Kingston became di-

After years of turning a blind eye, in late May 2010 Kingston police forces intervened harshly. These men look on.

Alone in Kingston

What is it like as a young Dutch woman, an outsider all by yourself, doing research in Kingston's deprived neighbourhoods? 'To be honest, it's not that hard,' Rivke Jaffe says. She has been visiting these inner-city neighbourhoods for over 10 years and has never been robbed or threatened. Being different works to her advantage: 'People call out to anyone who stands out from the crowd. They'll call out "fatty" to a really fat person, or "oney" to a person who has lost an arm. When I pass by, they call out "white girl". I tell them my name is Rivke, and that I am there to do research. This makes it easier for me to get to know people. It has never been hard to get to know residents.' Surprisingly, the arrest of Don Christopher 'Dudus'Coke in 2010 and the siege of his neighbourhood made Jaffe's work easier. 'Before the Dudus affair, the dons were really a taboo topic. 'For a while my research subject was suddenly the main topic of conversation throughout the entire country. In terms of my research, this presented a fantastic opportunity.'

Neither the government nor the dons have managed to change the living conditions in downtown Kingston, which are very poor.

vided into JLP and PNP islands. Nevertheless, someone still had to run these neighbourhoods. Residents were supposed to toe the line and support their party. And opposition supporters had to be kept at a distance, if need be with a little violence. Both JLP and PNP politicians used their street-level contacts to do the dirty work, relying on local strongmen – or dons, as they came to be called. The dons' power increased in the 1970s, as the government began to roll back its services in inner-city neighbourhoods under the influence of neoliberal policies. Increasingly, dons control their neighbourhood's economic affairs, as well as providing local security, welfare and conflict resolution. Nice outcome for the dons. But what are the implications for your average downtown resident?

Don provides job

Imagine living in one of Kingston's downtown neighbourhoods and desperately needing a new source of income. It's not as if you can just walk over to the nearest dole office. So what do you do? You go to your neighbourhood's don, or one of his right-hand men, who might be more approachable, Jaffe explains. 'These neighbourhoods aren't that big.' The don can do a number of things. 'For example, he might get in touch with a politician he knows, who in turn can contact a government office and tell them: "I've got someone here who needs a job." And then that office is expected to come up with a job for the person in question.' But dons don't necessarily need the politicians' help. They might also simply walk through their neighbourhood and notice a building being fixed up. 'He might go up to the construction site, and tell the person in charge: "I see you have work. I have three men who need a job." And it's not easy for the contractor to refuse.' ▶

Dons are not always on friendly terms

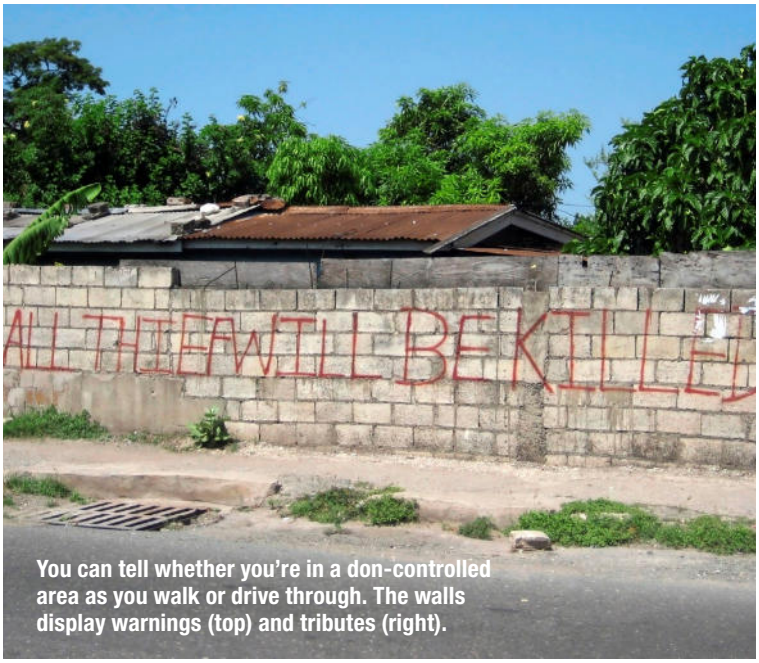
The name says it all: the don Christopher ‘Dudus’ Coke was arrested in 2010 and extradited to America on drug trafficking charges.

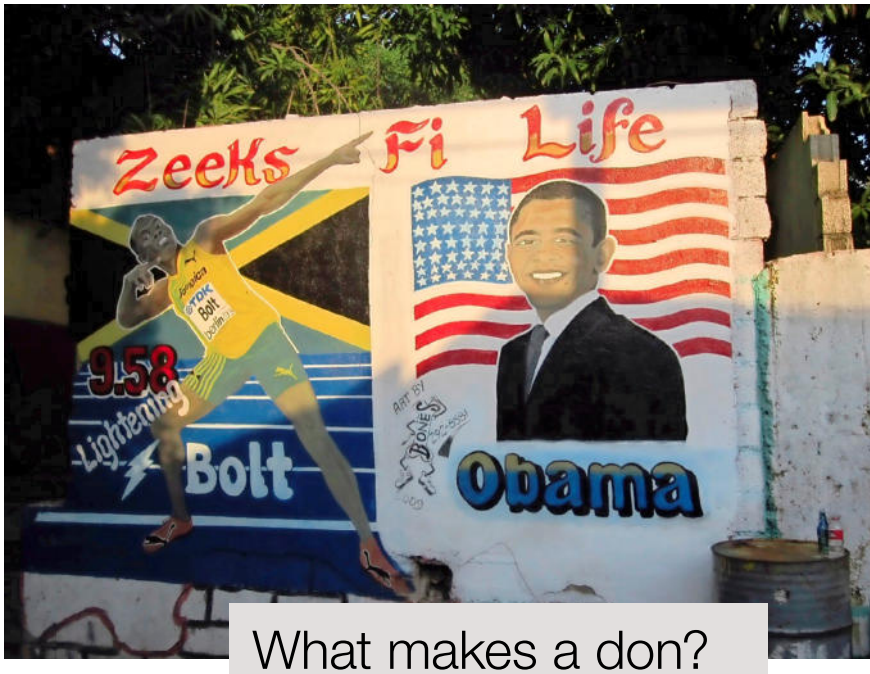
No murders?

In the Netherlands, security, like welfare, is typically considered a government function. Not in downtown Kingston. If the numbers can be trusted, the dons are better security providers than the government. Take Christopher ‘Dudus’ Coke, Kingston’s most notorious don. In 2010, he was arrested and extradited to the United States on drug and arms-trafficking charges. His extradition was preceded by considerable rioting, as many saw Coke as a benefactor and a hero of the people. He was seen, for example, as doing good work in terms of security provision. Under his leadership, the number of murders in his neighbourhood, Tivoli Gardens, was said to have dropped to zero. ‘These figures may not be entirely reliable, as some murders might never have been registered,’ Jaffe adds. Irrespective of the actual murder figure: ‘Many people believe in dons’ effectiveness and fairness. They’re convinced that an effective don can always find and punish wrongdoers.’ This punishment might be a beating, Jaffe says. ‘But it might also be banishment from the neighbourhood, as punishments are not always violent.’ People trust the dons, which gives them a major advantage over the police. ‘People will always tell the don who’s done what, while they’re often reluctant to talk to the police.’ The dons also provide for their people in other ways. For example, residents rarely pay water or electricity bills. Not because the dons run their own utility companies. ‘These are free because the energy and water companies are afraid to come into these neighbourhoods, not even to shut off the electricity or the water.’

Pay the boss

But dons don’t just run a charitable trust; these arrangements also benefit them personally. Dons don’t just derive an income from drug trafficking or various legal enterprises (such as construction companies that may obtain government contracts through shady deals or political connections), they also maintain a system of taxation. At least, if you want to call it that. Jaffe: ‘Neighbourhood residents tend to call it taxes. Outsiders call it extortion.’ Whatever the term, it boils down to businesspeople paying the don. ‘For example, the neighbourhood where I’ve been doing most of my research is close to a big market. Vendors based in the neighbourhood





You can tell whether you're in a don-controlled area as you walk or drive through. The walls display warnings (top) and tributes (right).

After Honduras, El Salvador and the Ivory Coast, Jamaica is the country with the highest murder rate, according to United Nations statistics.

might not have to pay the don any taxes, while market traders from outside might have to pay a daily fee. While people whose construction job was facilitated by the don might have to pay up to a quarter of their salary.' In short, the don's neighbourhoods resemble little kingdoms within the larger city of Kingston. The dons take care of their people, who in turn must fulfil certain obligations like voting for the right party and paying 'taxes'.

Now what?

Works for the residents, works for the dons, and works for some of the politicians. So… leave things the way they are? Some Kingstonians take a pragmatic approach in this regard. 'A senior administrator in the municipal government told me how, in organizing the refurbishing of the city's main market, he had split the contract between the two biggest dons at that time, Dudus and Zeeks (now both in jail, ed.).' While, officially, such contracts are subject to a formal tender process, as they are in Europe, he had chosen the legal alternative of 'forced account process'. 'He explained to me that, whether you like it or not, they're there. And whatever we do, they'll earn money off of the project one way or another. If we had given the contract to a company from outside, a cut of their profits would still have gone to the dons. Leaving the contractor with less money to pay the people who do the actual work. If I give the dons the contract, in the end more money ends up in the pockets of the people. So it's better to work with them.' Yet, less and less people seem to agree. Jamaica's attitude towards the dons is becoming harsher, partly because of pressure from the United States. The US authorities want to eradicate the Jamaican-American drug trade the dons control. In recent years, key figures such as Zeeks and Dudus have been arrested. Jaffe's final visit to Jamaica in the context of her research on downtown Kingston's 'street states' was last year. Will the end of her research coincide with the end of the dons's heyday? Only time will tell. ■

What makes a don?

Can just any ordinary criminal in Kingston become a don? Rivke Jaffe: 'I think those people who become dons would also have emerged as leaders in a different context. For instance, if they had had a more privileged background, they might have entered politics.' But no two dons are the same. 'Some dons are tough guys. Others became leaders because they made the right connections or because their father was the don before them.' Some become the don by flexing their muscles. 'But those are the weaker ones. The most successful dons are both intelligent and charismatic – it takes more than being scary to maintain a leadership position. This requires something closer to love. The former don in Jaffe's research neighbourhood was often referred to as Fada, father. 'People might describe the don's role as almost paternal, because he looks after them.'

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FURTHER INFORMATION

***The Caribbean City*, Rivke Jaffe (ed.), Ian Randle Publishers (2007):** about the culture, history and people of the Caribbean cities.

In search of impossible microbes

The NWO Spinoza Prize is the highest award in Dutch science. The winners receive 2.5 million euros to use for research of their choice. Mike Jetten, professor of microbiology at Radboud University Nijmegen, is one of four winners from 2012.

TEXT: ANTJE VELD

What did you want to be when you were younger?

'Definitely not something creative. My best subjects at high school were biology and chemistry. The MSc I took in Wageningen combined those interests.'

And what do you do now?

'I am a microbiologist, and study minute organisms invisible to the naked eye. I try to find new organisms that we can use to keep our air and water clean. Bacteria, for example, that can convert methane into carbon dioxide and water without the need for oxygen (they use nitrite). Many people claimed that methane-eating bacteria cannot exist without the presence of oxygen. When people say something is impossible that increases my resolve to go and find it.'

How do you go about finding such bacteria?

'First of all you must prepare carefully. Which locations on Earth have the right conditions for such bacteria? Natural gas (methane) must be present. Oxygen must be absent, and not too hot, cold or too acidic, etc. Finding such a place is not that difficult. In the Netherlands, such an ecosystem can be found in the Ooijpolder or the Twente Canal. We can collect a spade full of mud there and bring it back to the laboratory. Then it is a matter of taking good care of the sample so that the bacteria it might contain can grow. You need millions of cells before you can investigate these. Taking good care means ensuring that not too much air reaches the samples and that they have a constant supply of methane. Not too much one day and too little the next because bacteria do not like that. You also need to add nutrients such as salts and minerals. The most important ingredient is patience. Sometimes it can take a year before we can actually see something. I think that people did not have enough patience in the past, failed to look for mud with the highest concentration of bacteria and lacked the right equipment to care for the bacteria to properly grow. We ensured the best combination of these three factors and eventually found bacteria that eat methane.'

And why are bacteria that eat methane so useful?

'They are useful for two reasons. First of all methane is a greenhouse gas that enters our atmosphere via many different routes. We would rather not have that air pollution, so finding a way to clean it up is useful. These bacteria can help in the process. Secondly, we use the bacteria to purify water by removing the nitrogen compounds from it. Before they can eat the nitrate they need food to gain enough energy. Until now we have used bacteria that feed on methanol. It is cheaper to use bacteria that eat methane and that is possible now.'

Is that why you got the Spinoza Prize?

'Yes. We have discovered new species of bacteria that contain a range of novel, and thus interesting, cell structures. How we approach things here is typically Dutch by the way. It is called '*the Delft school of microbiology*'. Other countries focus more on the molecular level and unravel bacteria down to the cell structures. They focus less on discovering new species. I am quite proud that a small bacteria species now makes our water clean. Ultimately, we will all benefit from that.'

What else would you like to discover?

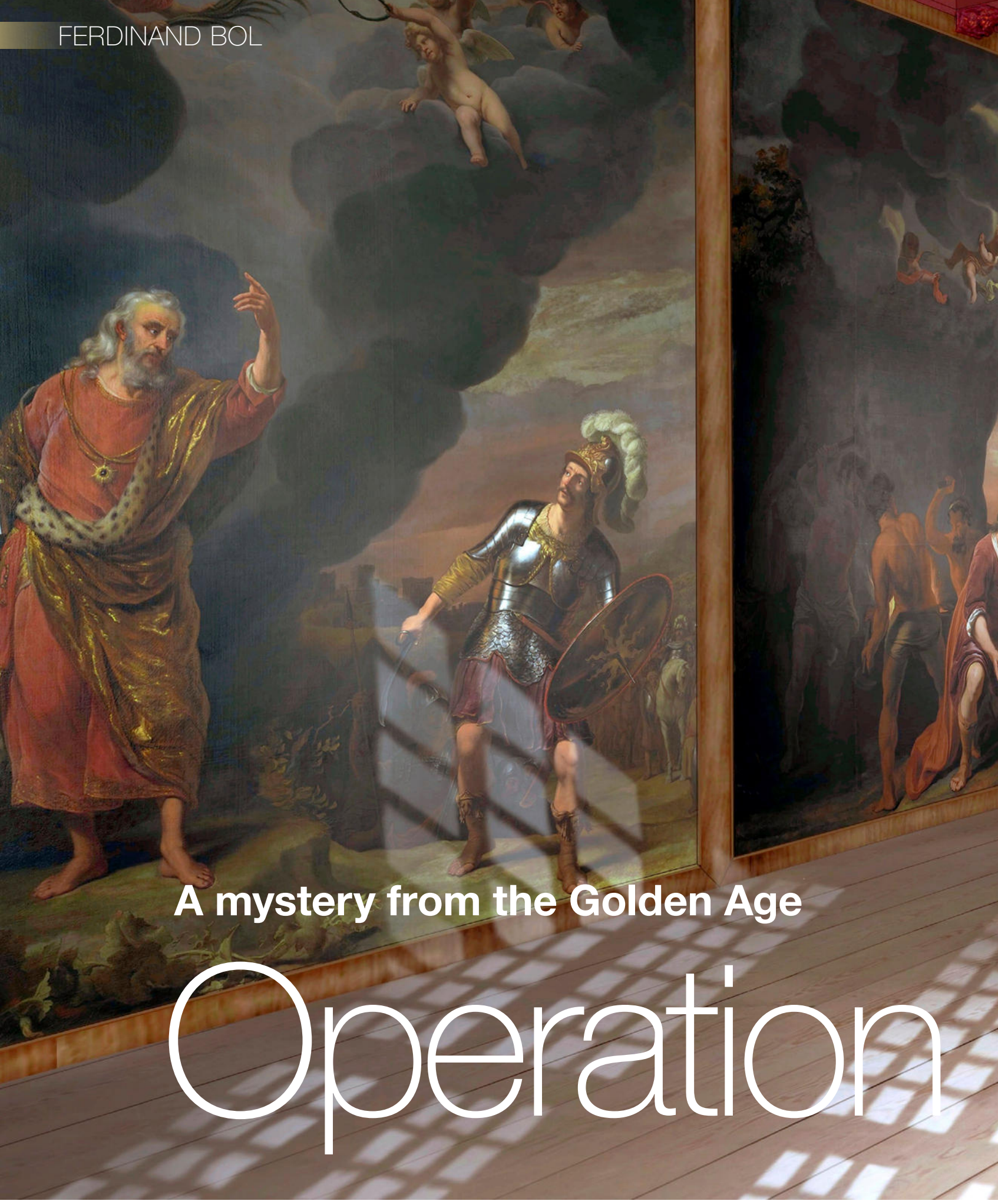
'Bacteria that use iron to break down methane must exist somewhere and bacteria that use sulphate to consume ammonia must exist as well. We can calculate the existence of these bacteria, but we also know that they are more difficult to find than methane eaters because they grow more slowly and there are fewer locations in the world with the right conditions. There is enough sulphate on ocean floors, but that is a hard location to reach. These bacteria could also be useful for water purification. The iron users are less interesting in this respect, but I want to discover those out of pure curiosity.'

Is that what you will use the prize for?

'Part of it, yes. As I want to pass on my knowledge and expertise, I will use a second part to train new people. Then I will invest a third part in deepening the research we were doing already.' ■

Biography Mike Jetten

1962 Born in Roermond
1980 Sint Ursula Horn Grammar School
1986 MSc Degree in molecular sciences from Wageningen University
1991 PhD in Microbiology from Wageningen University
2000 Professor Ecological Microbiology at Radboud University Nijmegen



A mystery from the Golden Age

Operation

Bol

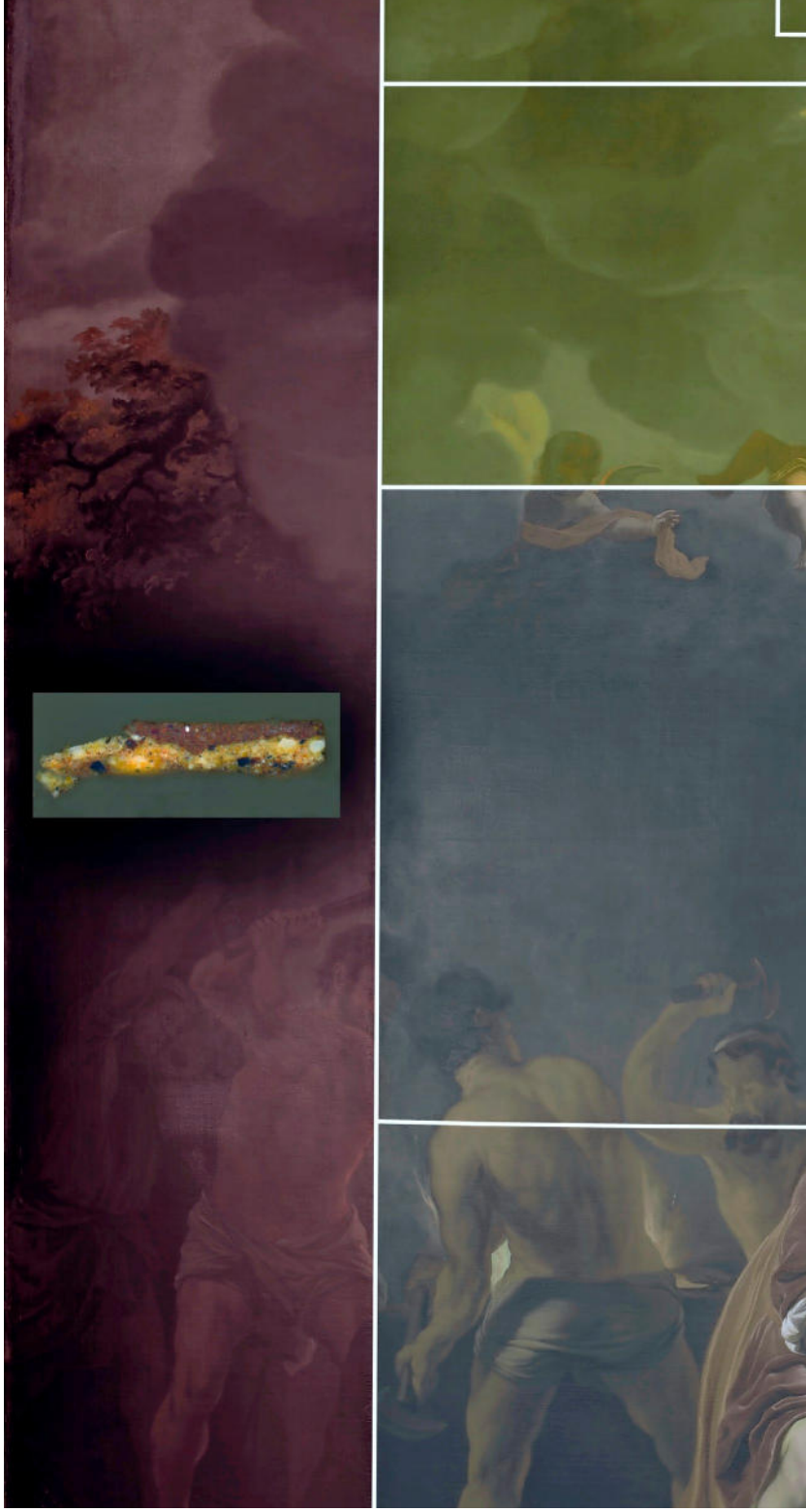
The gigantic paintings produced in about 1660 used to hang in a canal house in Utrecht. Who commissioned such costly paintings, and why? 'Solving a murder case is easier.'

TEXT: PAUL SERAIL

The canvasses grew bigger during their production

▶ **Nail holes show how the canvasses were once framed. Yet the holes also reveal that the paintings still have their original size, unlike many other works where pieces have since been cut off.**

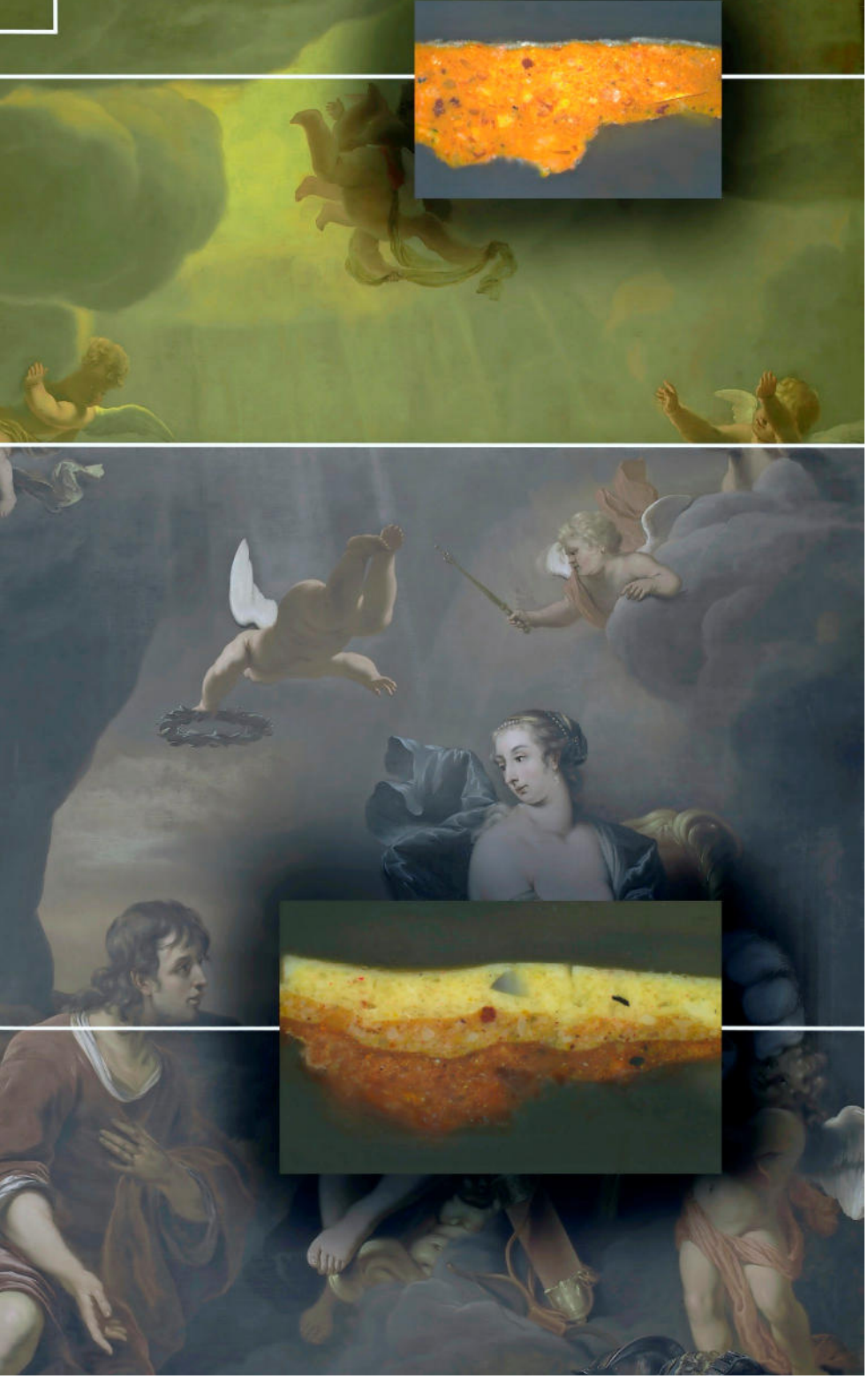
▼ **When the painting *Aeneas receiving a new Set of Armour from Venus* was finished, Ferdinand Bol added other canvas strips with angels and a strip with an extra smith.**



Whoever rang the doorbell at Nieuwegracht 6 in Utrecht at the end of the 19th century was received into an unusual room. The walls were completely covered by five enormous canvases from Rembrandt's famous pupil Ferdinand Bol. But the residents of this house were no longer charmed by these paintings and so they therefore presented these metres high master works to the Dutch state. Four of the canvasses have been housed in the Peace Palace in The Hague and the fifth canvas hangs in the Statenzaal in Den Bosch. Until recently we knew little else about these largest paintings of Ferdinand Bol. 'Many art historians had already dug their teeth into all of the questions surrounding these paintings,' says Margriet van Eikema Hommes, technical art historian at Delft University of Technology. Who did Bol make the paintings for? Did they form a single series? Where did they hang originally? 'It soon occurred to me that something strange was going on.'

Canvas is a patchwork

According to Van Eikema Hommes her work is a bit like a forensic investigation. 'But perhaps even more complex still,' she says. 'I have sometimes sighed: a murder case is a single event. These canvasses have been moved and adapted by different people over a period of 300 years.' An innovative aspect of the art historian's research is that she combines various research techniques to discover a painting's life history. The techniques she used ranged from digging in archives to microscopic paint research. One interesting fact about the paintings is the seams, for



◀ **Paint samples reveal that the five canvas strips from Bols' *Aeneas* do not share the same ground layer. We do not know why Bol varied these grounds. The notch on the top edge was cut out later for a ceiling beam.**

example. 'In the Golden Age, weavers could make canvasses more than two metres wide,' says the art historian. Bol's paintings are more than four metres wide. The artist could therefore have sewn two canvasses together. Then you have a single seam through the middle and that would have been nothing unusual. However, the giant works of Bol contain up to five pieces of material. They have been extended not only in width, but also in height. Perhaps the canvasses were later enlarged for the house in Utrecht. But did Bol make these enlargements? Or were they the work of a different artist?

Bol made them

Van Eikema Hommes studied these seams between the canvas strips on X-ray photos and took paint samples from them. This revealed something surprising. 'Under the ground layer that camouflages such a seam were paint layers from another picture. Evidence that that the painting was extended later.' Bol probably decided with his commissioner to keep on increasing the painting's size. 'His typical painting style can be recognised on all of the canvasses and the pigments in the paint samples are always the same.' This proves that Bol himself was ▶

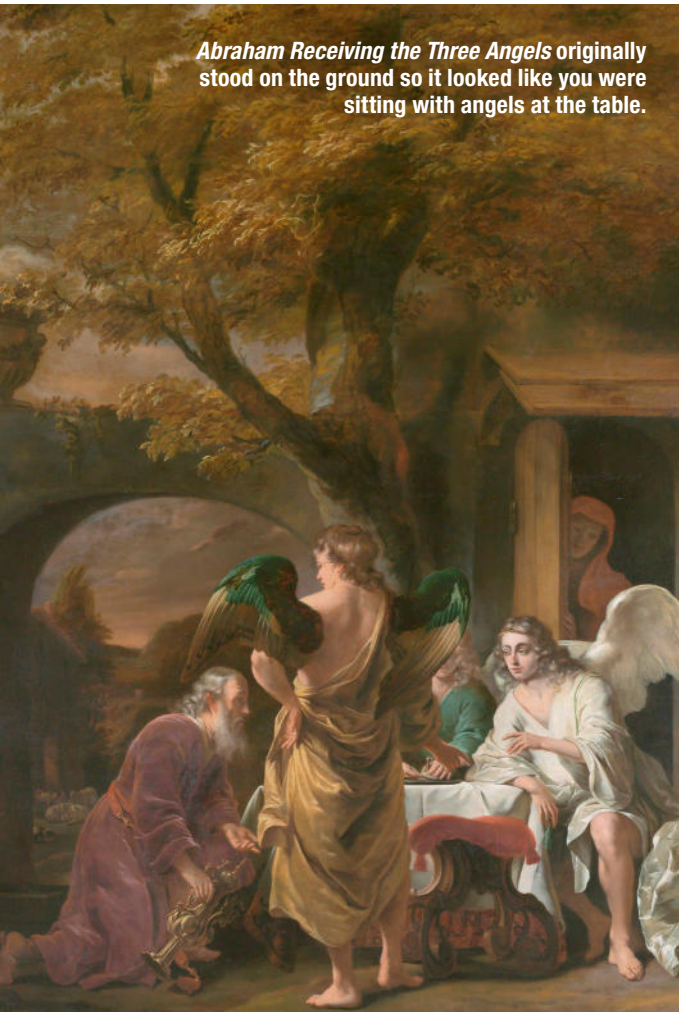
Chosen refugees

What do the scenes on Ferdinand Bol's largest masterworks mean? The themes are intimately related to the life of the rich widow Jacoba Lampsins, who commissioned the paintings. During the Eighty Year War, her family fled from Ostend. One of the works portrays the mythological hero Aeneas, who fled the burning city of Troy and received the divine commission to establish a new family line of rulers in Rome. Orthodox reformed Christians, chased out of the Southern Netherlands by the Catholics, often drew a parallel with the fleeing Trojans. Ostend was even called the new Troy, as the city was subject to a bloody siege for several years. Abraham and Moses, the main characters in two of the paintings, also had to flee their country and would become the founding fathers of a chosen people.

Protesting protestants

A political-religious conflict was taking place in Utrecht in 1660. The city had already in the late sixteenth century banned Catholic services in public and seized the estates and other possessions of the Catholic church. A large group of regents, however, enriched themselves with these, which led to opposition from a number of strictly reformed regents. They believed that the income should benefit the reformed Church. The rich widow Jacoba Lampsins wanted to join this strictly reformed group. She commissioned Ferdinand Bol to make the painting of the Biblical figure Joshua. God would help him to conquer the city of Jericho as long as his army left the city's treasures to God. Another painting that Lampsins ordered portrays King Cyrus. He gave back the treasures his predecessor had stolen years previously from the Temple in Jerusalem. With the paintings, Lampsins probably hoped to impress the regents from the strictly reformed camp.

Bol's 'wallpaper' served as a status enhancer



Abraham Receiving the Three Angels **originally stood on the ground so it looked like you were sitting with angels at the table.**

A good excuse to portray some nakedness: Pharaoh's daughter finding Moses, as she takes a bath.

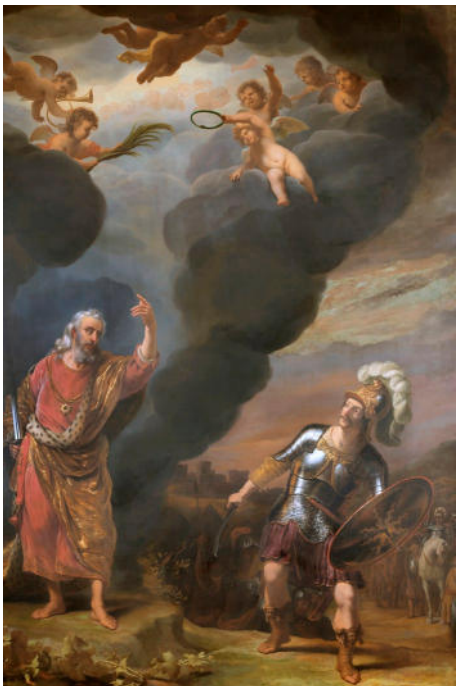
Busy Bol

Why did the largest works of Ferdinand Bol hang in the city of Utrecht? Bol worked almost exclusively for people in Amsterdam from the highest levels of society. They gave him enough commissions to build up a rich career. For example, he painted for the newly built Town Hall on the Dam and for the Admiralty of Amsterdam. Why did he take on the commission from a widow from Utrecht? 'Ferdinand Bol and Jacoba Lampsins may have met each other on several occasions,' says art historian Margriet van Eikema Hommes. For example, Michiel de Ruyter, the great naval hero in the Amsterdam Admiralty, started his career in the shipping firm of her family in Zeeland. Bol's clients were mostly strictly reformed people, the milieu to which also Lampsins belonged.

▶ responsible for enlarging his work. Furthermore, Van Eikema Hommes found no layers of dirt or varnish between the paint layers of the two stages, which suggests the paintings were still hanging in Bol's studio when they were extended.

Canvas had to be lifted

Ultimately Bol's paintings completely covered the walls of the large reception room in the house on the Nieuwegracht. The room no longer exists because the house was converted into an office, but Van Eikema Hommes discovered old floor plans that contained the dimensions of the room. 'It was centimetre work,' she says. 'The paintings fitted so well.' She paid a visit to the Utrecht location. 'Above the present-day modular ceiling the old beams still exist. These were repeatedly painted over. If that was done carelessly the paint also dripped onto the paintings. Each and every colour from the beams landed as spatters on the paintings.' Also the square notches made for the old beams on the top edge of four of the paintings match exactly. 'The paintings initially stood on the floor and reached exactly to the ceiling beams. In



◀▲ The themes of *the Captain of the Lord's Army appears to Joshua* and *King Cyrus returns the stolen treasures from the Temple of Jerusalem* are unusual. The commissioner probably heard the stories in the church. She commissioned them to gain connections.

the eighteenth century, wainscoting became the fashion. To apply this, the paintings had to hang slightly higher. Then notches were cut out of the top edge so that the paintings fitted between the beams.'

Wallpaper gave status

Yet, who had enough money to hang a room with five paintings from one of the most prominent masters? Van Eikema Hommes discovered that the commission came from an immensely wealthy reformed widow Jacoba Lampsins. Her family were the leading lights in Zeeland, but she was lower on the social ladder in Utrecht. 'Lampsins' greatest ambition was to belong to the higher social class in Utrecht as well,' says the art historian. There was only one way to achieve that. One of her sons had to marry a woman from the regent's class. By purchasing a house on the Nieuwegracht the family came to live between all of the people of any importance in the city. She subsequently decided to decorate her reception room with the most impressive wallpaper conceivable. Van Eikema Hommes: 'That one of the most important artists of the Dutch Republic did such a gigantic project for her must have made a deep impression.' And with effect: one of Lampsins' sons married a leading regent's daughter. ■

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! FURTHER INFORMATION

www.vredespaleis.nl: 4 of Ferdinand Bol's large paintings hang at the Freedom Palace in The Hague.
www.noordbrabantsmuseum.nl: in 2013 the Noordbrabants Museum will reopen. That is where *Abraham receives the three angels* hangs.