WUR from within: straight, sharp, transparent

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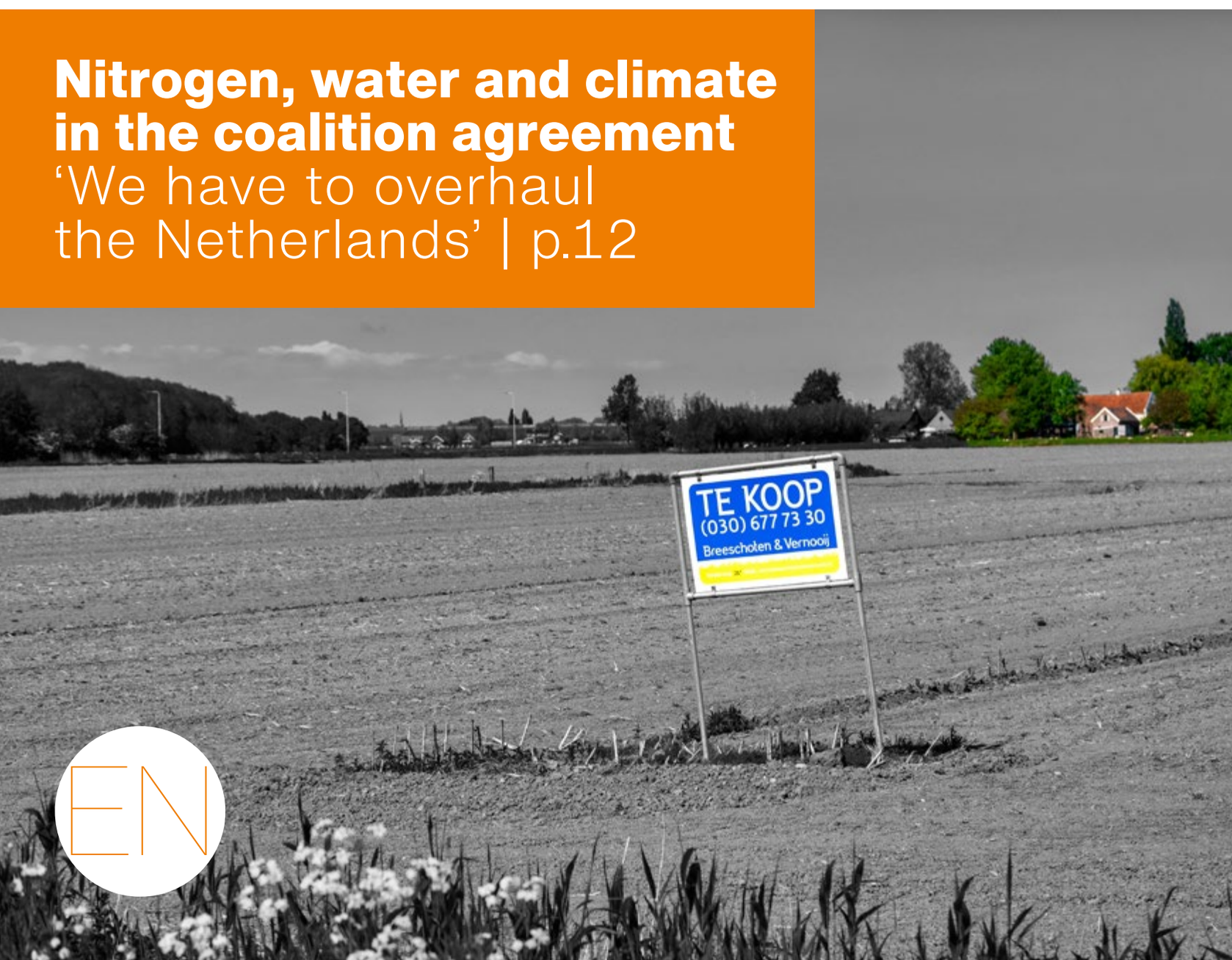
Nitrogen, water and climate in the coalition agreement

'We have to overhaul the Netherlands' | p.12



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FOREWORD

Maestro

The new cabinet wants to halve nitrogen emissions and reduce greenhouse gases by 60 per cent by 2030. That is ambitious, so there are hardly any complaints from the left-wing parties or campaign groups about a lack of ambition. But although we don’t know yet know the policy details, there have been other comments in the preview. How does the cabinet plan to achieve those targets? Will the implementation succeed?

‘There will be areas of the Netherlands in which livestock farmers must make far-reaching adjustments to meet nature-, water- and climate-related criteria. They will either have to farm less intensively or stop,’ says Animal Sciences Group director Ernst van den Ende (p. 12). But the government cannot unilaterally halve or eliminate ammonia emissions from livestock farms near nature areas; it has to work with other parties. There is a nitrogen fund with plenty of cash but farmers will only use it if they see a future in sustainable agriculture. The same applies to the climate goal, which requires higher water levels in peatland areas. That measure also needs to fit in with farmers’ own plans or else they will oppose it.

The government wants area-specific implementation of its climate and nature policy. Which means the 12 provinces will be in charge. Those provinces will have to deal with four ministers, responsible for Agriculture; Nature & Nitrogen Policy; Climate; and Spatial Planning. It was complicated enough already. The big question is how can all these players become an orchestra?

Albert Sikkema
Science editor

GREEN INSULATION

Green roofs such as the one on Lumen are not visible from the ground. But the roof on Omnia, which was finished last week, will be. Its eight varieties of *Sedum* will no doubt provide a colourful display in the flowering season. The green roof, which covers a little over a quarter of a hectare, will provide extra insulation against the cold and will help make the campus greener. Omnia will be finished at the beginning of March and the official opening is planned for 1 May. RK

Photo Guy Ackermans

Students allowed to visit orange countries

Students can travel to code-orange countries for exchanges, internships and thesis projects if they can prove their destination is safe.

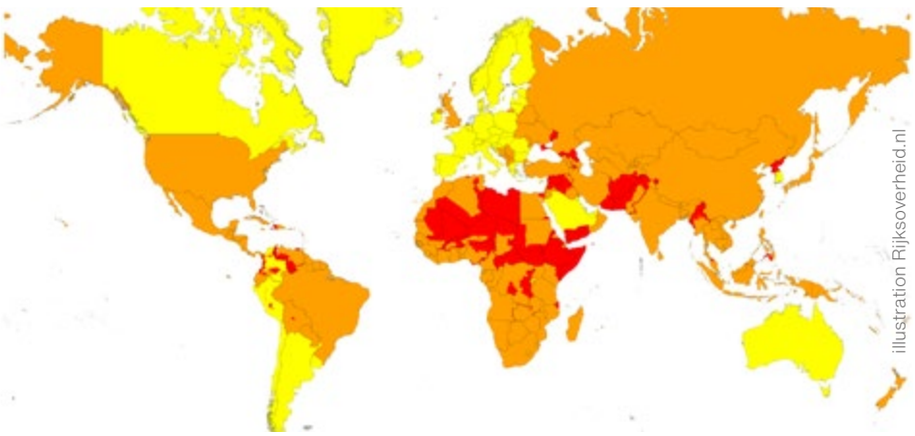

illustration Rijksoverheid.nl

The change in the travel policy for students came into effect on 17 December. It is currently a temporary exception that will apply until 31 August 2022, says Eric de Munck, Exchange Team leader. 'Exchange trips to countries that have risk code green or yellow were approved anyway before 17 December, but almost no one could travel to orange areas,' says De Munck. 'It was basically only possible if the student was a national of the country they were visiting.'

The change to the travel policy means students can request an exemption from the ban on travel to orange areas. 'Each situation is considered individually,' explains De Munck. 'A safety adviser and an assessment team headed by Dean of Education Arnold Bregt look at the requests. The student has to show that the situation on the campus they will be visiting is safe, and say what safety precautions they personally will be taking.'

Holiday

In December, a petition from a WUR student calling on the university to make the policy more flexible rapidly gained over 1500 signatures. 'Some students have had to postpone their planned exchange two or three times already. Of course you always have to weigh up what restrictions you impose for safety reasons against the students' ambitions. At the same time, it is becoming increasingly difficult to justify why you can't go on an exchange to an orange area when large numbers of people are holidaying in orange countries.' LZ

Read more on resource-online.nl.

Protesting for compensation

The student loan system is set to be abolished but that generation is left with huge debts, so the protests will continue.

Good news for future students in the coalition agreement for the new government, Rutte IV: the student loan system will be abolished as of the academic year 2023–24. What the new system will look like is not yet clear but it will probably be something like the performance-linked grant that applied before 2015, when all students got a basic grant and could borrow extra money.
The coalition agreement earmarks one billion euros for compensation for the student-loan generation. Although student unions are pleased that the loan system is being abolished, they say the compensation is not nearly enough. It seems to be about 1000 euros per student, which is wide of the mark according to the unions. Ama Boahene, chair of the national student union LSVb, told the Higher Education Press Agency that 'It is incredibly good news that the student loan system is finally coming to an end, but there still needs to be compensation for the student-loan generation.' Boahene says students with huge debts of tens of thousands of euros start out in life 10-0 down. 'It is unacceptable to leave them saddled with debt.'

'Students with huge debts start out 10-0 down'

Kick-off in Amsterdam

So the two student unions LSVb and FNV Young & United will continue their student-loan campaign, starting with a protest in Amsterdam on 5 February. 'We can't have a small group of young people paying the price for the cabinet's failed cost-cutting experiment,' say the activists on nietmijnschuld.nl. 'That is why we demand complete compensation for students who are covered by the loan system.' LZ

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Fifteen Wageningen poets, four of them from WUR, will be reading their poetry on the phone on request. The action is intended as the local run-up to the national Poetry Week. Next week (17-21 January), the poets will phone people between seven and eight in the evening and read out a poem. Go to the public library site (bblthk.nl) to book a poetic phone call. RK

Finally money for Kabul teacher training

Last week, WUR managed to pay part of the salary arrears to the teacher training programme in Kabul, Afghanistan. The 75 employees of the National Agriculture Education College (NAEC) received 9000 dollars to share between them.

The staff are still owed 72,000 dollars in unpaid salary. The remaining amount will probably be transferred to Kabul in instalments over the next few weeks. The money was transferred using an intermediary rather than through a bank.

Normal bank transactions with Afghanistan became impossible when the United States imposed sanctions on payments to the country. That is why WUR could not transfer any money to staff at NAEC. WUR is now investigating whether bank transactions are possible again.

Project leader Hans van Otterloo says the staff at the teacher training centre were delighted with the first salary they had received since last October. ‘“Today we had laughing faces again at NAEC,” the director told me on 10 January.’ AS

Wen Ying Wu wins the Cover Prize

The jury and the general public were not far apart in their selection of the best PhD thesis cover of 2021: that of PhD candidate Wen Ying Wu’s thesis entitled *Right tool for the right job*. Wu was the jury’s winner and came second in the public voting.

Public voting on the *Resource* website drew a record 4887 voters. After New Year in particular, it became a neck-and-neck race between Wen Ying Wu and Raisa Rudge from the Netherlands.

Style elements

Rudge (cover: *Mouthfeel*) won the online contest by a narrow margin, getting nearly 40 per cent of all the votes. The jury put her cover in sixth place, however, so overall she came third. In second place after Wen Ying Wu was Shanshan Yang (cover: *Dead wood lives*).

The jury was made up of *Resource* graphic designer Alfred Heikamp, Professor Marten Scheffer, Dean of Sciences Wouter Hendriks, *Wageningen World* editor Miranda Bettonville, and Professor Jan Willem van Groenigen. ‘Its strength lies in its simplicity,’ says Heikamp of the winning cover. ‘All the style elements are used brilliantly: the genetic alphabet, the subtle use of colour, and the way it plays on the title.’

The winning cover was designed by Nicky Vermeer of the graphic design bureau Univorm in Arnhem. Wen Ying Wu studied one of the CRISPR-Cas systems with which you can cut up DNA in particular ways. The title of the thesis has been cut out in the letters of the DNA code. Literally, as holes in the cover reveal the title that is printed on the next page.

‘Its strength lies in its simplicity’

The DNA letters (AGTC) were not chosen at random either. Wen Yung Wu says that geneticists can detect the code she studied in the jumble of letters. This concept runs through the book: each chapter is preceded by a title page with a DNA sequence that is dealt with in that chapter. RK

Wen Ying Wu. Photo Mihris Naduthodi

‘The Netherlands doesn’t have room for hyperscale centres’

If it’s up to Zeewolde municipality, Meta, Facebook’s parent company, will be allowed to build a gigantic data centre in the polder there. A terrible idea, says professor of Land Use Planning Martha Bakker.

Meta aims to build one of Europe’s largest data centres – a so-called hyperscale data centre – on the clay soil of Zeewolde. The municipality approved the required change to the zoning plan last month. Bad idea, says Bakker. ‘Space in the Netherlands is so scarce. There are so many important competing claims on what little space there is! If you must take farmland out of production, which is unavoidable given the demands on space, at least do something useful with it: construct houses, place wind turbines or return it to nature. But please, no distribution hub or data centre.’

The professor understands why the municipality did not immediately turn down Meta’s request. ‘Municipalities must pull out all the stops to maintain facilities and services and keep their budget balanced. Increasing the value of land through redesignation is an easy way to generate more income.’ Bakker would rather leave the distribution of scarce space to an institution at the national level. ‘In part because municipalities compete with each other for the custom of land users. That results in perverse stimuli which leads to inefficient land use.’ The fact that it is bringing back a minister of Spatial Planning suggests that the new government shares her concerns.

It is still not clear whether or when the Zeewolde data cente will go up. Meta needs 166 hectares of land for it, half of which still belongs to the Central Government Real Estate Agency. The Upper House of Parliament seized on this to step on the brakes, passing a motion instructing the agency to suspend land transactions until the new cabinet’s policy on spatial planning is ready. ME

Strategic Housing Plan approved

The WUR Council has approved the Executive Board’s Strategic Housing Plan. This means that the science groups will make plans in the coming year as to how staff will share workstations and combine working from home with working on campus.

At the end of last year, the WUR Council approved the plan after some concessions were made by the Executive Board. The board promised that there will always be a workstation for staff on campus, so there will be no pressure on them to work from home. The board also promised that the decentralized works councils will have the right to be consulted on plans by the sciences groups.

Jelle Behagel, Chair of the WUR Council: “We agree with the board that rather than investing in new buildings, we should improve the occupancy of the available workstations. However, we are imposing conditions so that staff members are involved in the implementation and have a say on their workplace.” AS

Crucial gene discovered in dandelion

Researchers at WUR and the biotech company Keygene have found a crucial gene for apomixis in dandelions. Apomixis is the property whereby plants can produce seeds identical to the parent plant without pollination. The researchers expect the discovery to lead to important innovations in plant breeding.

The Wageningen scientists — who collaborated with colleagues in Japan and New Zealand — found a gene that allows plant embryos to grow without the flowers being pollinated. In an article in Nature Genetics, they describe how the gene (given the name PAR) functions and how it affected the work of Gregor Mendel, the founding father of genetics.

The discovery of the gene is the crowning achievement for the Wageningen biotech company Keygene, which started studying apomixis 15 years ago. The company used the dandelion, which was known to be able to produce seeds genetically identical to the parent plant without pollination. The interesting feature of wild dandelions is that in addition to the apomictic plants, there are also dandelions that do need pollination to produce seeds. The researchers compared the DNA of these two plants. Researchers in the Biosystematics chair group at WUR found that the PAR gene was normally switched off in egg cells but is switched on in apomictic dandelions. The egg cell with an active PAR gene thinks it has already been fertilized and starts to divide even though pollination has not actually taken place.

Hawkweed

Their colleagues in New Zealand studied apomixis in hawkweed. This plant species was used by Gregor Mendel in the 19th century in his groundbreaking work on the inheritance and segregation of traits in plants. In his cross-breeding experiments, Mendel found that trait segregation did not always occur in hawkweed. The researchers now know this was because of apomixis.

The New Zealanders also discovered something that the Keygene scientists had noticed earlier: all plants have PAR genes but plants with apomixis have a PAR gene with an extra piece of DNA. That extra piece of DNA is in almost the same place on the genome in hawkweed as in dandelions, even though the two species are not closely related. Further analysis showed that this piece of DNA is a ‘jumping gene’ that can change position in the genome from time to time. If this jumping gene attaches to the PAR gene, more or less by chance, this leads to apomixis.

Lettuce

Now that the researchers understand the origins of apomixis, they can start encouraging it in other plants. In collaboration with the Japanese plant breeding company Takii, Keygene has already managed to activate PAR genes in lettuce and sunflowers. Initiating apomixis in crops has big advantages for plant breeding companies because it lets them copy desirable traits from the parent plant to the seed. AS

The PAR gene allows plant embryos to grow without the flowers being pollinated

A Little Wiser

How do you forecast a horrific winter?

It is said that there's a cold winter ahead, but how do meteorologists know that? The year 2021 broke one heat record after another, even in December. Gloves and woolly hats stayed in the wardrobe and there was no sign of a white Christmas. And yet cold weather is coming, according to meteorologists' forecasts. The weather website Weer.nl says we can expect a harsh winter this year, possibly on a par with that of 1963, the coldest ever. What do meteorologists base their forecast of a horrific winter on?

'Air circulates around the earth on a large scale,' says Jordi Vilà, professor of Meteorology and Air Quality. Warm, moist air rises from the surface of the ocean around the equator and moves through the atmosphere towards the polar regions. That movement distributes the heat around our planet, determining the weather in each season. 'When meteorologists make a seasonal forecast for the winter, the atmospheric circulation, as it is called, is a key factor,' says Vilà. The weather phenomenon known as La Niña, which was observed at the end of last year, can disrupt that circulation. During La Niña, cold seawater from the depths of the ocean comes to the surface and warm water is pushed westward. This creates a cold current in the Pacific Ocean near Peru, and warm air rises in unusual places. 'That disturbs the atmospheric circulation, which could cause Europe to get colder weather,' explains Vilà.

'Meteorologists use the same computer models for their seasonal forecasts as the weather presenters on TV use for short-term forecasting,' he adds. The difference is that in the short-term forecast (up to seven days ahead), observations of the past few days can be used to make the forecasts more reliable, and that's not possible with the seasonal forecasts. Vilà: 'That makes these kinds of forecasts difficult and uncertain.'

Personally the professor doesn't think we're going to get an extreme winter, and certainly not in the coming month. 'There is currently a high-pressure area over the Atlantic Ocean.' For really wintry temperatures, you need a cold front coming from the east, such as a high pressure area over Russia. 'The recent prognosis also suggests that for now the temperature will not be very different to the average for this time of year, which is around zero degrees,' says Vilà. So skaters don't need to start sharpening their blades: there is no guarantee of a big freeze and loads of fun on ice. NVTWH

'For now the temperature will not be very different to the average for this time of year'

Jordi Vilà, professor of Meteorology and Air Quality

Every day we are bombarded with sometimes contradictory information. So what are the facts of the matter? In this feature, a scientist answers your burning questions.

Asking questions makes you wiser. Do you dare ask yours? Email us at redactie@resource.nl

Illustration Marly Hendricks

Kenyan farms often too small

Small-scale farmers in East Africa can increase food production levels substantially with intensive farming if they are given extra money, but they often do not have enough land to make a living even so. These findings come from the PhD research of Wytze Marinus in the Plant Production Systems chair group.

Marinus spent five years studying farmers in two locations in Kenya. Each season, all the farmers were given a voucher worth 100 dollars for agricultural inputs such as fertilizer and seed. The vouchers led directly to higher crop yields at all the sites. Maize yields, for example, increased from 16 per cent of the theoretical maximum to 40-50 per cent.

Even so, only half of the farmers at most achieved incomes above the poverty line with the vouchers. With current farm sizes, most of the farmers were unable to earn a 'living income' – the income that is required for a nutritious diet, clothing, housing, schooling and healthcare. Marinus found that if farmers in two African regions are able to increase yields per hectare to 50 per cent of the maximum potential yield, 70 and 90 per cent respectively of the farmers could live off their small plots. Farmers in a third region would still need more livestock and land to make a decent living. AS

Photo Shutterstock

'Vaccinating hens improves animal welfare'

Calls are increasing for chickens to be vaccinated against avian flu. Currently, the virus is being tackled by culling all the animals in infected and adjoining barns and by requiring all other poultry to be kept indoors through the winter. PhD candidate Joost van Herten says this is the wrong way to implement the Dutch One Health policy.

'In this policy we want to promote the health of humans, animals and the environment in an integrated approach,' says Van Herten, who recently got his PhD on the ethics of zoonoses. 'But in practice you often see a conflict of interests between people and animals, where the people win. In this case, we don't vaccinate chickens because other countries ban imports of vaccinated poultry. Trade interests trump animal welfare.'

'Vaccination is better than culling,' says Van Herten. 'The vaccine protects the bird and prevents the virus from mutating into a variant that makes humans ill. But vaccinations are not enough, he adds. 'We have to eliminating the causes of pandemics and look at the concentration of poultry farms too. Environmental health is the basis of One Health.' AS

Diet can keep chronically ill patients fitter

An adapted diet can help improve life for chronically ill patients suffering from PAH, claims Paulien Vinke (Human Nutrition and Health) in her PhD thesis.

Pulmonary arterial hypertension (PAH) is a rare chronic disease in which patients have high blood pressure in the lungs. Patients often suffer from reduced fitness due to loss of muscle mass and function, and this affects their quality of life. The disease eventually causes an enlarged right ventricle, heart failure and an early death.

Vinke studied levels of the vitamins and minerals that are associated with fatigue in PAH patients. A sizeable proportion of the patients had an iron deficiency. This deficiency is partly caused by underlying chronic inflammation and is directly related to a decline in fitness.

Diet

In an animal experiment, Vinke found that mice with the same disease that were fed on a normal diet had an enlarged ventricle, fibrosis and smaller muscles. If they were fed on a special diet containing extra protein, leucine and anti-inflammatory nutrients (fish oil and prebiotics), diseased mice maintained their normal muscle mass and had healthier right ventricles.

So Vinke concluded that an adapted diet has potential for improving the quality of life of PAH patients. Exactly how diet can be made part of the treatment package for PAH patients will be addressed in the next stage of the study. SS

Heat mainly affects women

Far more women than men are exposed to high temperatures.

This is shown in a study by WUR researcher Bardia Mashhoodi (Landscape Architecture and Spatial Planning). Far more women than men live in neighbourhoods that have relatively high temperatures. Women living in older and cheaper housing are particularly affected by this gender inequality.

Even in a small country such as the Netherlands, there are big differences in temperature. In an average summer, the large cities in the west can be 5 to 6 degrees hotter than the northern Netherlands. This geographical difference affects everyone in these areas. Mashhoodi discovered a significant gender inequality as well when she compared the temperature to the male-female ratio in individual districts. Women are in the majority in over half of the warmer districts, and hardly any warm districts have significantly more men than women. In the 65-plus age category, more women than men live in warm neighbourhoods. Statistically, 1 per cent more women than men in a given neighbourhood is associated with a 0.1-degree higher temperature.

Women are overrepresented in cities, which happen to be hotter

Service sector

According to Mashhoodi, the differences are related to the male-female ratio in urban and rural areas. Women are overrepresented in cities, while men form a majority in rural areas. And cities happen to be much hotter. Women mainly work in the service sector, which is concentrated in urban areas, while men work more in agriculture than women do.

Mashhoodi feels it is important to acknowledge these gender differences. 'They are often linked to other forms of gender inequality.' Inequality in housing is not an issue that is easily solved, but there are solutions for unequal exposure to heat. 'For example by planting more vegetation and facilitating access to green areas.' RK

In other news science with a wink

SEX

Researchers at the Berlin university hospital Charité Universitätsmedizin have discovered the region of the brain linked with the clitoris. This clump of brains cells seems to be larger in women who have frequent sex. Whether that suggests a causal relation, the neurologists do not venture to say – it would require further research. Volunteers wanted.

LINGUISTIC POVERTY (1)

1500 of the 7000 languages in the world will have disappeared by the end of this century, researchers at the Australian National University have calculated. Remarkably, one of the causes of this is education. The more educated people are, the bigger the chances that they stop using their mother tongue. More travel is deadly for indigenous languages too.

LINGUISTIC POVERTY (2)

As it happens, Australia is bottom of the class when it comes to maintaining its languages. Before colonization, the country boasted 250 languages. Now only 40 are still spoken, and 12 are taught to children. The UNESCO Decade of Indigenous Languages starts this year, and will zoom in on the right of indigenous peoples to use their own language.

LEGGY

A millipede has been found in Western Australia that has 1306 legs. Millipedes don't of course have exactly 1000 legs, as their name suggests. The record to date was 750 legs. The new species, *Eumillipes persephone*, lives a few tens of metres underground and is blind. It finds its way step by step by step by... RK

Useful oddball in our guts to be nutritional supplement

Akkermansia, a Wageningen discovery, is the only benign mucus eater in our intestines and could help us lose weight. This bacterium is expected to be marketed as a product next year.

The European Food Safety Authority (EFSA) approved the intestinal bacterium *Akkermansia muciniphila* for use as a nutritional supplement in pasteurized form last September. Clara Belzer, an associate professor of Microbiology, is pleased with the approval and calls it a major step given the bacterium's history and potential. She joined the research team of Willem de Vos, then professor of Microbiology and the man who discovered the bacterium, 11 years ago. She is trying to figure out how the bacterium works in the intestines.

Akkermansia is found in larger numbers in thin people and probably has a big influence on people's weight. Together with researchers at UCLouvain in Brussels, Willem de Vos's group carried out a trial with mice that were given live *Akkermansia*. The mice gained much less weight than mice without this bacterium. The bacterium is an oddity as it belongs to a very different family to all the other gut bacteria. It also behaves like a pathogenic bacterium yet it has a positive effect on the host, as Belzer explains. '*Akkermansia* feeds on the intestinal mucus but has a positive effect: it causes the host to make more mucus. It's a positive feedback mechanism.'

On the market

The mouse experiment was followed by trials with people with overweight. The trial subjects could carry on eating as normal and were given live or pasteurized Akkermansia, or a placebo. They did not lose weight during the two-week and six-week trials, but the people taking Akkermansia did have a healthier profile for their blood and urine. For example, the blood contained less cholesterol and had improved blood sugar levels.

Trial subjects who drank *Akkermansia* had healthier blood and urine profiles

The trials showed that the bacterium is safe for consumption, so the EFSA approved the use of pasteurized Akkermansia as a nutritional supplement. The Belgian company A-Mansia Biotech, founded by Willem de Vos and Patrice Cani of UCLouvain, plans to launch the first pasteurized *Akkermansia* product on the market next year.

In her basic research on *Akkermansia*, Belzer aims at discovering the mechanisms through which the bacterium affects human health. 'It is unlikely that everything in the intestine is determined by one bacterium, such as *Akkermansia*. You can see the intestines as an ecosystem in which a variety of bacteria and micro-organisms work together.' Belzer is therefore looking for the core set of bacteria that are found in all people. She expects it will take at least ten years before she has made a bacterial community that is applicable for humans. SS

Willem de Vos is now a distinguished professor emeritus. He works at Helsinki University on Akkermansia *and other potentially probiotic bacteria such as* Anaerobutyricum soehngenii.

WUR and the coalition agreement: nitrogen, water and the climate

‘LOOK FOR THE BEST MEASURES FOR EACH AREA’

By 2030, the new Dutch cabinet aims to reduce greenhouse gas emissions by 60 per cent and cut nitrogen emissions to a level at which three quarters of the nature in the country can recover. WUR advised the ministry of Agriculture, Nature and Food Quality on these challenges. *Resource* asked Ernst van den Ende, the new director of the Animal Sciences Group, how feasible the plans are. Text Albert Sikkema

What challenges lie ahead?

‘Nitrogen is crucial and was one of the biggest sticking points for the last cabinet. The nitrogen problem is hampering industry, housing construction and livestock farming, and nitrogen emissions must be cut so we can build and do business again. WUR is looking specifically at ammonia emissions from agriculture, especially livestock farming. We have kept repeating that we must address the climate challenge and water quality at the same time, since the Netherlands does not yet meet the standards of the Water Framework Directive. Take an integral approach so farmers get an overview of the issues.’

Which measures are good for nitrogen, the climate *and* water?

That can vary from one area to another. The issues on the Veluwe, where you’re dealing with nitrogen-sensitive nature, are different from those in the peatland areas, where the main problem is methane emissions from peaty soils. So our advice is: look for the best measures for each area. Ammonia emissions from livestock farms are deposited in the surrounding area, which is another reason why an area-specific approach is useful.’

How does the cabinet want to tackle it?

‘The coalition agreement mentions three measures: technical measures for reducing emissions on the farm; buying up and devaluing farmland to make extensive livestock farming possible; and buying out polluting farms. This is not easy to implement, however. The government would prefer to concentrate on buying up farms that are close to nature areas, because that is the most effective strategy. But that entails an expropriation process that can take years, whereas we want to cut the nitrogen surplus and methane emissions tomorrow. Voluntary buy-outs, with the farmer making the decision, are a less effective strategy but can be done more quickly. And you need on-farm innovations that the farmer can introduce quickly too.’

Is technology the solution?

‘Technology alone is not the solution. You need a combination of measures. Farms are closing down every year, and that helps. Farmers are installing new systems that reduce the ammonia emissions, and that helps too. And farms in peatland areas and close to nature areas are obliged to adopt more extensive farming methods so as to reduce emissions. That means reducing herd sizes, so livestock farmers need to develop new business models in which they get some income from nature management, water storage or landscape maintenance as well. The government must fund these kinds of public services.’

5 January 2022- Christianne van der Wal-Zeggelink (VVD), minister of Nature and Nitrogen, on her way to talk with formateur Mark Rutte. She will have to tackle the nitrogen problem in the coming years ◆ Photo ANP/Robin Utrecht

‘TECHNOLOGY ALONE IS NOT THE SOLUTION’

Where should livestock herds shrink?

‘There are going to be areas of the Netherlands in which livestock farmers must make far-reaching adjustments to meet nature-, water- and climate-related criteria. They will either have to farm less intensively or stop, and that is a bitter pill to swallow. A lot of farms are fairly sustainable, with a small environmental impact. The real problem is that we’ve got too many farms in a small area and between them they emit too many pollutants. In the Netherlands we want to do everything in a small area, but that’s impossible – we’ve got to make choices. The Remkes Commission, which studied the nitrogen problem, said the same: not everything can be done everywhere.’

Should the government decide what can be done where?

‘That is really tricky, because there are several different policy goals involved. We want more housing, we want more wind and solar farms in the interests of the energy transition, and, if you look at the EU’s Farm to Fork policy, we want 20 per cent of Dutch farms to be organic. It’s important to realize that organic farming is more extensive, so it requires more land. How do you ensure that the land that will be freed up when farmers are bought out is made available for extensive or organic farming, or for nature, rather than for data centres, solar farms or high-end villas? I don’t have the answer to that.’

What answer does WUR give them?

‘We supply the facts about how you can improve nature values in nature areas, and we develop options for farmers. Examples would be technical innovations, as well as concepts such as circular agriculture and nature-inclusive agriculture, which entail new business models for farmers too. And we are helping to shape this in area-focussed processes. These processes are very important now, because we’ve got to overhaul the spatial organization of the Netherlands to meet the nitrogen, climate and water challenges. We are eager to play our part in that.’

Should the provincial councils take the lead?

‘Central government has shifted a lot of powers in the areas of agriculture, nature

THE COALITION AGREEMENT IN A NUTSHELL

- The cabinet wants to cut CO_2 emissions by 60 per cent by 2030. A 35-billion-euro climate fund will be established for the energy transition, industry and transport, so the energy supply is climate-neutral by 2030. The agriculture sector must concentrate on reducing the use of artificial fertilizer, methane emissions from cows, and greenhouse gas emissions from peatland areas;
- A 25-billion-euro transition fund will be established for area-specific nature, climate and water policy. Nitrogen emissions must be halved by 2030, so that three quarters of Dutch nature areas are brought below the critical deposition value;
- More than six billion euros is available for buying up farms and livestock; nearly six billion for downgrading from intensive to extensive farmland; two billion for nature-inclusive agriculture; and one billion for innovative barn systems;
- A land bank will be established for moving livestock farms and turning farmland into less intensively farmed 'landscape land' on which farmers provide ecosystem services as well as growing food;
- The transition from chemical pesticides to integrated crop protection will be accelerated.

and the environment to the provincial authorities. They've got to come up with plans. Edo Gies (senior researcher into Land Use Dynamics, ed.) and Tia Hermans (head of the Agro & Nature research domain, ed.) have already done a study for the Province of Gelderland on how the nature targets can be achieved. They've gone for a combination of technical measures on the farm and targeted buying out of livestock farms in the Gelderse Vallei. But here again, the question is: will the government succeed in buying out the biggest polluters or are you better off negotiating with the farmers about shifting towards more extensive farming methods for the benefit of nature?'

Is the nitrogen problem exposing fundamental problems in our food system?

'We are always talking about the farmers, but at root, our consumption patterns have a negative influence on nature and the climate too. If we drive to the supermarket, we emit a lot of CO_2. If a conscious consumer from an affluent suburb drives their SUV to an organic farm shop at the weekend, the same thing happens. If the demand for food doesn't change, you can reduce livestock herds but nothing will really change.'

'NOTHING WILL REALLY CHANGE IF THE DEMAND FOR FOOD DOESN'T CHANGE'

Because?

'You just shift the problem elsewhere. If Dutch agriculture shrinks a lot, food gets imported, and you'll just have to wait and see how sustainable those products are. We are quick to say, "food needs to cost more in the Netherlands", but if that means shoppers in the supermarket end up choosing meat from Brazil or from the US, you're just moving the nitrogen and climate problems elsewhere. We talk a lot about the export position of our agriculture, but we need to talk about its import position as well. How dependent do we want to be on food and raw materials from abroad?'

Horticulture, the most profitable and innovative food sector, does not feature in the coalition agreement.

'True. The highest incomes are earned from greenhouse vegetable and ornamental plant cultivation, as we always see from the annual income figures for agriculture and horticulture. Greenhouse horticulture uses a lot of gas and faces the massive challenge of switching to more sustainable energy sources. But it is making headway. Some horticulturalists are already climate-neutral because they buy CO_2 from industry in Rotterdam. A group of horticulturalists in Noord Holland have switched to geothermal power and are using heat from the Microsoft data centre to heat their greenhouses. That strikes me as a lot more sustainable than the planned new data centre in Zeewolde. Spatial planning is needed in such cases too, so that the government locates data centres near to greenhouses and residential neighbourhoods that can make use of the heat they generate.' ■

Ernst van den Ende
Director, Animal Sciences Group

Corporate campus

Vincent Oostvogels

The new year has begun. A good moment to look ahead. Which multinationals are still missing on our campus? Friesland-Campina and Unilever are a prominent presence with their own research centres. Upfield, formerly the margarine branch of Unilever, is building fast. But surely there's room for a few more.

After all, the sustainability issues of our time can't be solved without close collaboration with the big boys, as we in Wageningen know all too well. In which case, the best thing is of course to offer them a high-visibility spot on the campus, so that new students can see where to go for answers right from day one.

'Hopefully the new president will have close links with industry'

Time for an inventory, then. As I said, you can't miss FrieslandCampina, Unilever or Upfield. Then we also have the Chinese dairy giant Yili, the German seed concern KWS and the Japanese tractor multinational Kubota, but they are all somewhat tucked away in Plus Ultra and Plus Ultra II. Their visibility leaves room for improvement. And Bayer-Monsanto is not on the campus at all, but on the other side of Wageningen, so it doesn't count. The multinationals that are only linked with WUR through WUR professors' or directors' ancillary posts don't count at all. Physical, visible presence: that's what counts.

In that sense, there are loads of untapped opportunities. There aren't that many players dominating the global food system, so it must be possible to get more of them to Wageningen. Where are all the big input producers (Cargill, ADM, ...), livestock breeding companies (Genus PLC, Hendrix Genetics, ...) and retailers (Walmart, Carrefour, ...)? And let's look beyond agri-food too. On the timber market, IKEA is a significant player. I read recently that IKEA has now become the biggest private forest-owner in Lithuania and Romania. Imagine the scope it would offer our ecologists and foresters if we got an IKEA Innovation Centre!

There are a lot more possibilities besides. A new section of campus is to be developed on the other side of the Mansholtlaan: Born Oost. It's waiting to be covered in buildings. Hopefully the new president of WUR will have close links with industry, so work can start.

Vincent Oostvogels (25) is in the first year of his PhD research on the restoration of biodiversity in dairy farming. He dreams of having a few cows of his own one day.

PICTURE

FLYOVER

Crossing the Nijenoord Allee to reach the campus from the Churchillweg is quite an ordeal for cyclists. But that is going to change. A planned flyover will replace the traffic lights, and give cyclists the red-carpet treatment. They will always have right of way and can sail across the junction. The cars on the Nijenoord Allee will go 'underground'. There will be rounds of public consultation on the plans this summer. Construction will start towards the end of the year at the earliest. RK

Illustration Gelderland Provincial Council

Language analysis by Marten Scheffer speaks volumes

INTUITION IS BACK

Feelings and intuition are overtaking rationality and common sense as our drivers. This trend started 40 years ago, shows language analysis by Marten Scheffer's group.

Text Roelof Kleis

It started with a bit of playing around, says Marten Scheffer, professor of Aquatic Ecology. He was playing with Google Ngrams, a tool that reveals how often single words or combinations of words occur in books. Mainly in English, but Chinese, French and German are available as well. 'A really nice tool,' says Scheffer. 'Google has digitalized millions of books, creating a wealth of information that you can search using Ngrams. That database fascinated me.' Then he had an idea. 'We are living in what they call the "post-truth era", a time when it seems as though rational arguments are respected less and less. What can Ngrams tell us about that?'
Scheffer searched for words related to feelings and rationality, and soon found a pattern. The frequency of 'reasoning words' gradually increased after the Industrial Revolution, until a turning point was reached around 1980. Words that relate to feelings and intuition followed the opposite trend, decreasing steadily in frequency until 1980, and then rapidly increasing. The seed was sown for an in-depth study.

Five thousand dimensions

'That was just cherry-picking,' says Scheffer. 'You find what you look for. It needed a more thorough look. How has the use of the 5000 commonest words in a language changed over time? Is there a pattern to it? I couldn't tackle these questions on my own.' So Scheffer asked data specialists Els Weinans and Ingrid van de Leemput to help him, and also his Belgian colleague Johan Bollen, who he has already written several papers with. The team attacked the task with an analytical technique known as PCA, which stands for Principal Component Analysis. 'A PCA shows what the most important factor is in a mountain of data,' explains Scheffer. 'The PCA determines the best way of summarizing a pattern in a multidimensional space. In this case, there are 5000 dimensions: the frequencies of the 5000 most frequently used words over time. The technique is widely used in pattern recognition.'
The pattern that was found confirmed the initial impression: since 1980, rationality has been losing importance and emotion has been gaining ground at quite a pace. This was further underlined by measuring the emotional load of the 5000 most frequently used words. Scheffer: 'That means how positive or negative, active or passive people consider words. There are lists documenting that. The average emotional load of those words turned out to match the pattern we found. That is a powerful confirmation.'
Ngrams tells us about language in books. But does that make it a reflection of what is happening in society? To find that out, the researchers used Google Trends, which shows how often words are used as a search term. They found a strong correlation between the use of

Since 1980, rationality has been losing importance and emotion has been gaining ground at quite a pace ◆ Illustration Valerie Geelen

words in books and in search terms. Google Trends only goes back to 2004, so word frequencies in *The New York Times* since 1850 were included too. And the same pattern appeared again. Scheffer: 'So, yes, there is a relation between what people are interested in and what appears in books.'

Neoliberalism

So are Scheffer and his team on the trail of something new? Yes and no. 'The trend of the increasing role of rationality in society has already been described in various ways,' says Scheffer. 'It's been demonstrated in language use too. But the change we are showing is new, and of particular interest. We have been moving towards a world in which interest in the expert, science and rational argumentation is diminishing. And that is not something very recent: the change started back around 1980.'

It is guesswork as to what set this change in motion. Scheffer points at the extreme neoliberalism of the time. 'The 1980s saw the start of an era in which many people got the feeling that wealth and economic growth were not benefitting them. A society in which that happens is always defended in terms of rational arguments. But if that rational world isn't working in your interests, I can imagine that there's a tendency to devalue rationality.'

'NEW WAYS OF SPREADING INFORMATION OFTEN INFLUENCE PEOPLE'S IDEAS'

According to Scheffer, the big influence of social media adds to that effect. 'Social media have a massive impact and create a strong idea that there is a lot of injustice in the world and that others are better off than you are. New ways of spreading information often have a big influence on people's thinking. Just look at the rise of printed matter, pamphlets and broadsheets in the period of the French Revolution.'

The genie is out of the bottle. And it will stay that way, thinks Scheffer. 'I don't really think we can turn the tide. Language is a giant tanker. And maybe that's a good thing too. In the course of 150 years, the balance between thinking and feeling has shifted too far in the direction of thinking for a lot of people. Maybe it's time to find a new balance. Even science needs to be open to how people feel about things. The return of intuition, I would call it. You get the best results when there is balance.' ■

The mission of Sterrin Smalbrugge

‘I want people to start loving reptiles’

Sterrin Smalbrugge does doctoral research at Wildlife Ecology and Conservation, writes books, gives educational performances, presents the Videoland programme *Reptielengek!* (Reptile-mad!) and took part in *Expedition Robinson*. Where does she get her drive from?

Text Luuk Zegers

Smalbrugge’s life reads like a fairy tale: from introvert researcher to media celebrity. She lives with her boyfriend in a shepherd’s hut in Spain, which she has made a safe haven for animals. And it all started with a love of scaly crawling creatures.

Why reptiles?

‘Reptiles are endlessly fascinating. They have adapted to their habitat in so many different parts of the world in the most brilliant ways. A nice example is the spider-tailed viper, which lives in a mountain range in Iran where few animals can survive. At the end of its tail hangs something that looks and moves like a spider, which it lures birds with. They think they’ve found a tasty snack, but it turns out they are the snack. How clever is that?

Or look at the way the crocodile can bite a zebra in half with its jaw, and with the same jaw can gently transport its babies. Or the evolution of poison, and the fact that humans can use that poison as medicine.

What is more, reptiles play crucial roles in ecosystems, for example in pollination, seed dispersal and water purification. And they do it for free! That’s why we must respect, appreciate and protect reptiles.’

It is your ‘Life’s mission to make the world a better place for undervalued animals, especially reptiles’. How are you doing that?

‘I’m doing it with two tools: science and education. There are more than 11,000 species of reptile and that makes this group of animals more diverse than birds or mammals. And yet much less research is done on reptiles. When fundamental knowledge is lacking, how can you possibly establish an adequate conservation plan? Biodiversity is crucial to saving the world, but there is one whole animal group that we tend to forget. I want to expand that body of knowledge with my research.

I also use education to improve the public image of these animals, with things like theatre performances, the TV programme *Reptielengek!*, my work for *National Geographic Junior*, and by writing children’s books. I want the young generation to see how amazing this animal group is, so that the nature conservationists, scientists and animal caretakers of the future will focus on reptiles and not just on birds and mammals as they have in the past.’

Why is it important for public opinion about reptiles to improve?

‘It makes it easier to get funding for scientific research on reptiles and to protect them. Take lions, for example: they have soft fur and beautiful manes. They are on posters in children’s bedrooms.

'In my shows I try to show the young generation how special this class of animals is, in the hope that future nature conservationists, scientists and animal keepers will also focus on reptiles.' ◆ Photo Sterrinswildworld

When someone shot the popular lion Cecil in Zimbabwe in 2015, that person received death threats and had to go into hiding. But if 300 crocodiles are slaughtered somewhere because a villager was attacked, no one says a word. Everywhere I go, people chop off black mambas' heads. It is sheer discrimination: because reptiles have scales instead of strokable fur, they apparently don't deserve the same attention. My big hero Steven Irwin said, "Humans want to save things that they love". So if you want to protect reptiles, you'd better make people start loving them.'

WUR doesn't have a degree programme that focusses on reptiles. So what made you decide to study here?

'I didn't want to be just a number at a big university and at Wageningen there was scope for your own interests and development. Ecology was a logical choice, because it teaches you to really look at interactions in nature. I have spent hours talking about zoology with Arie Terlouw – one of my favourite teachers at WUR. He can enthral an audience with his stories about it. At one point he said, "You've got so much to tell people about reptiles, let's start sharing that!" So then I gave several lectures, while still a student myself. First, about the king cobra, and then about reptile superheroes. That drew the national media's attention, which set the ball rolling, and I started to do educative theatre performances. Later, when I was doing my Master's in Forest and Nature Management, I met Art Rooijakkers (a well-known TV presenter, ed.). He helped me find my way

'A wild snake moved in, which I see when I'm doing laundry'

‘If you want to protect reptiles, you’d better make people love them’

‘When I was a student I started giving lectures, first about the king cobra and then about reptile superheroes. That drew the national media’s attention, which set the ball rolling.’ ◆ Photo Sven Menschel

around the media world and through him I ended up with National Geographic Junior and Videoland, with my show *Reptielengek!*’

You took part in *Expedition Robinson*. What was that like?

‘You’ve got to survive under primitive conditions, with people who are very different to you. So you need to let down your guard and cooperate. You learn a lot about people and about yourself: it’s a kind of pressure cooker for life lessons. I always thought I couldn’t get on very well with people because I’m shy and an introvert. That might sound strange given that I seek attention in all sorts of ways. But I need an audience to fulfil my mission. In spite of my shyness, it turns out I can get on well with people. Non-human animals are still my favourites, but I have rediscovered the beauty of humans.’

You are doing doctoral research on the ecological trap hypothesis. What is that?

‘It’s about the indirect influence of people on animals. People are constantly making changes to the habitat. Unnatural habitats can look more attractive to animals than their natural habitat. If they then start making disproportional use of them, leading to lower survival or reproduction rates, that is called an ecological trap.
I am looking at that in relation to the influence of water structures on toads in Spain. One of my ideas is that water storage tanks amplify or distort the mating calls of toads. That makes other toads think: hey, there’s a party over there! Then they fall into the tank and fewer of them survive.’

How are you experiencing the Covid period?

‘The pandemic is affecting every aspect of my life. Theatre shows have been postponed up to seven times, so I’ve lost a lot of earnings. And it’s very sad to get messages from young fans who were looking forward to my shows. I try to compensate for that by sending them cards and video messages. Due to travel restrictions, we couldn’t do the filming for programmes either.
I focus as much as I can on what *is* possible, such as my work for *National Geographic*, and writing books. My first adult book comes out at the end of May. It’s about reptiles too. I get hope from my contact with followers and fans. But my love of nature is my biggest anchor. My boyfriend and I live in Spain, in a shepherd’s hut high on a mountain in the Sierra Nevada National Park – one of the most beautiful nature areas in all Europe. We are trying to make it a safe haven for all animals. We’ve made a rabbit warren there, hung up nesting boxes for bats and birds, and dug an amphibian pond where threatened species of amphibians can breed too. A wild snake recently moved in, which I often see when I’m doing laundry. And ibexes pass through our back garden.
More and more people from our area know about us now. I recently got a phone call from the electrician, who had found a snake. Normally he would have chopped off its head, but he had heard about what we are doing, so we could save the snake. That way, an attitude changes that is as old as time itself, which is a wonderful thing to see.’ ■

Sterrin Smalbrugge (1993) is doing her PhD in the Wildlife Ecology and Conservation chair group, made the Videoland programme *Reptielengek!* (2019), is an ambassador for *National Geographic Junior*, has written several children’s books and performs in educational live shows. Her first book for adults about reptiles will be published in May 2022.

‘THE COURT READ OUR REPORT VERY CLOSELY’

Last week, a court ruled that the animal rights group Dier&Recht cannot claim that dairy products cause severe suffering in animals because the cow and calf are separated shortly after the birth. The court based the judgment partly on the Discomfort Analysis that Wageningen Livestock Research carries out. Resource phoned Karel de Greef, one of the researchers.

In dairy farming, new-born calves rarely stay with their mothers. Most are moved to calf hutches shortly after birth. ◆ Photo Shutterstock

How do you feel about your Discomfort Analysis playing such a big role in the court’s decision on this high-profile case?

‘That’s precisely why we do it! It just proves how important it is for us at Livestock Research to assess discomfort among animals in a meticulous and systematic manner. We carried out the first Discomfort Analyses for the ministry of Agriculture; then the animal rights group Wakker Dier commissioned an update to the report. This lawsuit shows the relevance of the analyses.’

The court concluded that Dier&Recht cannot talk about severe animal suffering based on this report. Do you agree?

‘Yes. It is incredibly difficult to determine discomfort anyway. As animal scientists, we quantify it by assigning a score based on the severity of the discomfort, how long it lasts and the frequency. Separating the calf from the cow shortly after birth gives a high discomfort score for the calf. That is partly because of the scoring method: those one or two days of discomfort form a large proportion of the time the calf spends at the dairy farm, which is usually about 14 days. But is that the same as severe animal suffering? “Animal suffering” has very different connotations compared with the more neutral term “discomfort”.’

‘I AM WARY ABOUT GETTING UNINTENTIONALLY SUCKED IN BY ONE OF THE TWO PARTIES’

So it is not scientifically possible to determine unambiguously how severe the discomfort is?

‘Exactly. The behaviour of both the calf and the mother shows that they don’t like being separated. But we don’t know to what extent the calf truly experiences it as negative. We can’t really measure that and the experts vary considerably in their assessments. If you look at nature to find a biological explanation, calves usually spend the first few days of their lives alone, as is the case for the young of roe deer. I understand the frustration when scientists are unable to give a straightforward answer about the degree of discomfort, but that’s just how it is. We can only go so far in understanding the emotions of animals.’

So is it right that Dier&Recht is not allowed to appeal to freedom of speech with its controversial dairy campaign?

‘Oh, you won’t hear me saying that! The court makes that decision; it is not for me or Livestock Research to comment on its ruling. I will, however, say that the court read our report very closely. The consideration in the judgment that there “is insufficient general consensus” and that the 2020 Discomfort Analysis “does not provide sufficient grounds at present” to conclude that separating the calf from the mother at birth causes severe suffering is spot on.’

I read that Dier&Recht is considering further proceedings on the substance of the case. Would you be prepared to appear in court as an expert witness?

‘At Livestock Research we are usually willing to do that because of our public role, but preferably at the request of the court rather than one of the parties. As scientists we stand on the sidelines and I think that is how it should be — because that is when we are most valuable to society. I am wary about us getting unintentionally sucked in by one of the two parties and losing our reputation for impartiality.’ ME ■

Microbiologists are building bacteria that convert CO_2 into food

Can we eat our way out of the climate crisis?

Is your hamburger or protein shake going to be made out of CO_2 in the future? Yes, if it's up to microbiologist Nico Claassens. His group is working on developing bacteria that convert CO_2 into nutrients such as sugar. 'The operation is comparable with replacing the heart of a mosquito with that of an elephant.'

Text Stijn Schreven

The idea of storing carbon dioxide in biomass is not new. About three billion years ago, cyanobacteria (or blue-green algae) were way ahead of us in using the gas as a source of carbon, with the aid of sunlight – and photosynthesis was born. A relative of the cyanobacteria later got into plant cells, where, as chlorophyll, it does the same job. In the volcanic ocean bed, prehistoric bacteria do this as well, not with sunlight but with energy from hydrogen, for example.

What is new here is that assistant professor Nico Claassens (Microbiology) and his group want to attempt to outdo nature. They are building a faster and more efficient substitute for the Calvin cycle, the essential reaction chain for binding CO_2. The Calvin cycle converts CO_2 into sugars and amino acids, for example. It is the commonest carbon-binding route in bacteria and plants, but it is slow and inefficient. The main enzyme in the cycle, Rubisco, was 'invented' when there was hardly any oxygen on Earth. Now the air consists of about 21 per cent oxygen and that causes a problem in the enzyme. It binds not just CO_2 but oxygen as well, losing some of the bound CO_2 in the process.

Claassens and his colleagues are therefore looking for an alternative. They are making use of existing enzymes, which in theory can form a better cycle between them. 'In nature, there are about 5000 reactions, enzymes, and we select a couple of them for the new cycle.'

Heart operation

This year, Claassens' group and Sarah D'Adamo (Bio Process Engineering) started building up a synthetic cycle, starting with the *Escherichia coli* bacterium. 'We've got the best tools for that bacterium,' Claassens explains. 'We've got a lot of changes to make.' The operation is comparable to 'replacing the heart of a mosquito with the heart of an elephant,' says Claassens. 'They are both hearts, but the system around them works in very different ways. *E.coli* doesn't even have a Calvin cycle and doesn't naturally grow on CO_2 but has a totally different metabolism. The heart of *E.coli* is the glycolytic process, which uses sugars as nutrients and converts them through reactions into all the substances the cell needs. Apart from replacing the heart, you've got to change all the connection points as well.'

A full CO_2 -binding cycle involves 10 to 15 enzymes but the researchers are testing them in stages using 'modules' of three to four enzymes at a time. They switch off the enzymes that are native to *E.coli* and place the module in it to fill the gaps. Then they watch to see whether the bacterium grows. That is what is fascinates Claassens about lab work: 'The creativity of designing a little slice of life. Building it bit by bit – that is awesome.'

Although the research is based on the idea of outdoing evolution, ironically enough Claassens needs evolution now and then during the process. 'The module we are inserting is not perfect and might not work well. Sometimes we need the evolution of bacteria in our exper-

iment in order to arrive at efficiently working modules.' Not all bacteria will manage to survive and grow after the 'heart transplant', but a small number of mutants probably will. They multiply and eventually come to dominate. That's evolution in practice.

Edible CO_2

Claassens hopes to have a working synthetic cycle in *E.coli* in two to three years' time. There are promising applications for this. You can use carbon dioxide from bacterial biomass to produce green fuel, or proteins and other nutrients. This could even be done independently of agriculture if we feed the bacteria on a chemical energy source such as hydrogen from electricity. In December, Claassens won a grant from the Innovation Fund for the protein transition with the project Microbes4Food, in collaboration with Julia Keppler (Food Process Engineering) and Laurice Pouvreau (Wageningen Food & Biobased Research). Claassens breeds the bacteria, and Keppler and Pouvreau study the characteristics of the proteins from them.

'Sometimes we need the evolution of bacteria in our experiment'

The techniques for upscaling are ready. In the 1970s and 80s, the Soviet Union in particular made use of micro-organisms (yeasts in this case) to produce fish feed from petroleum on a large scale. Whereas the economy was the main driver back then – petroleum was cheap – there is renewed interest now for sustainability reasons, with hydrogen as an energy source. Several companies, such as the Finnish SolarFoods, are already breeding bacteria in large reactors with a view to converting carbon dioxide into food. Claassens is one step ahead of the existing companies in that his group seeks to improve the characteristics of bacteria as food by making extensive genetic adaptations.

But is nature smarter?

Claassens' work in synthetic biology is pioneering, which means it can also fail. 'Maybe we'll find out that our cycle doesn't work, and that there is more to it than a chain of enzymes. Maybe the Calvin cycle will still work better than our theoretical designs, and we just don't realize that yet. That could be an outcome of our research.' But if it does work, Claassens dreams of applications that could contribute to a sustainable world. ■

Assistant professor Nico Claassens (Microbiology) with his bioreactor in which bacteria grow on CO_2. ◆ Photo Guy Ackermans

A STUDENT SPACE ODYSSEY

Don't be surprised if you come across student Serag Badr gazing through a large telescope in a Wageningen park. Serag recently founded the astronomy association WASA, and he dreams of one day having his own company 'in space'. Student editor Laura Bergshoef accompanied him one evening, stargazing with him and quizzing him about his passion.

Text Laura Bergshof

A cold night wind whistles through the park next to one of the star-shaped blocks of flats close to the campus. Walking across a big patch of grass in the dark is student Serag Badr, carrying a large telescope. Yellow light shines through the windows of a few student rooms in the distance. 'Look, the clouds are slowly drifting off over there,' calls Serag, pointing skywards. He puts the telescope down, unfolds the tripod and focusses the lens on the moon. 'If we are lucky, we'll clearly see meteorites, planets, Orion and the Andromeda galaxy.'

Perseids

Serag is a third-year Bachelor's student of Land and Water Management and the founder of Wageningen Astronomy Student Association (WASA), also known as Aldebaran. The association was started six months ago and is not officially recognized yet. But there are already two full WhatsApp groups with more than 200 members, and a further 100 are taking part through other channels. They sometimes arrange to meet in the evening, Covid measures permitting, to go stargazing together. Serag: 'Last summer we watched the Perseids from this very park. They are a meteor shower that that leaves light-emitting stripes in the sky. They are also called falling stars. That was the first WASA meeting. I distributed flyers the week before and a lot more people came along than expected: about 60. Members can also attend lectures and events related to astronomy on campus.'

'ASTRONOMY IS JUST REALLY COOL'

'OTHER CIVILIZATIONS MIGHT SEE DINOSAURS HERE'

For Serag, WASA is a step towards a company of his own, which he has been dreaming about for years. He took his management exam this morning in the Leeuwenborch. 'WASA is a venture in which I can afford to make mistakes, and with which I can learn all the ins and outs of building a network. I think that is probably the hardest part of setting up a successful initiative: putting together a motivated team. Starting a student association is a good exercise.'

Cool

'Wageningen already has diving associations, but no astronomy association yet,' adds Serag. 'So I thought, I'll start one myself, then. It works the same way when

A MESSAGE FROM SERAG:
Are you interested in space, or would you like to help launch the first student astronomy association in Europe? Then you are welcome! You can find us on Facebook @aldebaran_wasa and there is currently no membership fee.

you start your own company: you find out what there is demand for, and what doesn't exist yet. And anyway, astronomy is just really cool. You can see from the number of members that I'm not the only WUR student who thinks so. With the association I am also showing that astronomy doesn't have to be an extremely expensive hobby. You can get two telescopes like mine for the price of a new PlayStation.' Serag concentrates on turning a wheel on the telescope. Then he gets excited: 'Come and look, through the viewer. Can you see it? Wait a moment. The clouds are in the way. The moisture in the clouds deflects the light, making the image hazy again.'

Dinosaurs

Serag turns the wheel again. 'Look again,' he says, and your reporter stares through the viewer. The moon! 'Beautiful, isn't it?' The telescope zooms in on part of the moon where the craters are clearly visible. Serag: 'The light from distant heavenly bodies takes time to travel to the earth. When you look at the moon, you are going a little more than one second back in time. Civilizations that train their telescopes on the Earth from a distant planet might see dinosaurs.' Serag opens an app on his telephone that shows lots of red dots. 'The clouds should by rights have gone by now but the wind is not strong enough, so they are hanging around longer.'

In his small student room on the 14th floor, Serag shows me another telescope. Apart from that, there's just a bed, a desk and several bookcases filled with hundreds of biographies. And the WASA flyer on one of the doors.

When did his fascination with the stars begin? 'Ooh, when I was a little kid.' He picks up a photo from his desk. It shows a little boy standing in front of a white screen, surrounded by children's books about dinosaurs and a toy rocket hanging in the air. 'I've read a lot about astronomy and space travel ever since I was a child. Space travel is now developing rapidly and a lot of exciting things are happening. I can see a lot of potential there for my own company. Moving polluting industries from the Earth to the moon, for example. Take the nitrogen problem. Agriculture is a major source of nitrogen. Already now, scientists – here too – are experimenting with growing plants in moon soil. If that works well, we'll have solved the nitrogen problem. How cool would it be to apply the knowledge from my degree in space, in the form of my own company?'

Student Serag Badr recently started the astronomy association WASA. 'I've read a lot about astronomy and space travel ever since I was a child.' Photo Sven Menschel

Official

Making the association official, so that it will continue after he has graduated, is Serag's goal for this year. An official association gets a subsidy and storage space, he says, which is handy for cameras and telescopes. 'But you don't get to become an official association just like that. The association must first have existed for three years, and you must register with the Chamber of Commerce. In the next few months, I'm going to do that and launch a professional website.' ■

Key people: Valeria Puzzolo

They are indispensable on the campus: the cleaners, caretakers, caterers, gardeners, receptionists – the list is long. *Resource* seeks out these key people. This time, meet Valeria Puzzolo (34), who works in the restaurant in the Forum.

Text Milou van der Horst ◆ Photo Guy Ackermans

‘When I was 18 my family got into financial difficulties, and I had to work as well as go to school. I opted for catering because I liked cooking. But I was lazy and I stopped studying so I only had work left. I still regret that choice, but I’ve got to learn to live with it. I could invest time and money in studying again but the chances of getting a better job are small because my competitors on the job market are 10 years younger than me. I see them every day on campus. Maybe I will start a course next year, though; my child will start school then and I’ll have more time.

But I can’t grumble. I’m intelligent, but there’s plenty of challenge in this job too. And my contract goes on for another couple of months, so the Covid crisis hasn’t had a direct impact on my income. I came to the Netherlands from Italy last year; my husband works here at the university. The working conditions are much better here. In Italy I worked five days a week for 12 hours a day for the same salary I get here for three eight-hour days. I can spend more time with my family now.

I work in the Grand Café, the restaurant and the catering service. I enjoy it all. In the restaurant I prepare food, bake bread and keep the salad bar filled. Everything must be displayed clearly and attractively. The catering work appeals to me because you work independently and go to various different places. Working in the Grand Café is the easiest: I just have to know how the coffee machine works. Although it did take me a while to get the names of the coffees right. In Italy, café latte and latte macchiato are the same thing, but here they’re different. A student once asked me for a “latte” and I gave him a cup of milk, ha ha. I know now that he meant a latte macchiato.’

‘It took me a while to get the names of the coffees right’

Campus ◆ residents

FabLab Wageningen

In imitation of Massachusetts Institute of Technology (MIT) in Boston, where the first Fabrication Laboratory was established, Wageningen has its own FabLab now too. The workshop for new technology is housed in Plus Ultra II, next-door to the Starthub for innovative student companies. It has a 3D printer, a laser cutter, a foil cutter, and a milling cutter. And they are all computer-guided, says Marcel van Dijk, one of 20 volunteers who keep the FabLab (a foundation) going.

The FabLab primarily supports young Wageningen startups. The 3D printer has just made several bee containers for the company InsectSense. Other things made here include Reshore's prototype for a floating breakwater, and apparatus for FarmVent and Livestock Robotics.

The FabLab primarily supports young Wageningen startups with new technology

But the FabLab is also open to researchers and companies from outside WUR, says Van Dijk. The dairy giant FrieslandCampina recently asked to use the FabLab. The company is also working with the Bioprocess Engineering chair group to find out how WUR can recycle its plastic waste. One of the questions is which plastics go into the rubbish bin, and whether you might be able to use them in the 3D printer.

Is Van Dijk looking for more volunteers? 'That is tricky at the moment with the coronavirus rules, but people who enjoy working with machinery and making things together with others are always welcome.' AS

There are about 100 companies on campus. We introduce them to you in *Resource*. This time, meet FabLab in Plus Ultra II.

All the flavours of the world can be found in the WUR community. MSc student of Environmental Sciences Elena Olivera Begue (25) shares a dish that reminds her of home in Barcelona.

Flavours of WUR

Arritas

'This dish is special to me because it reminds me of my grandmother. She used to cook it when we visited her on Sundays, and it was always a relaxing moment with the family. She makes it with meat, but I recently changed my dietary preferences, so my version is vegetarian. I don't know what the original name of this recipe is, but I call it Arritas. That combines the words for rice (*arroz*) and vegetables (*verduritas*).'

Ingredients (for 4 people):

- olive oil and salt
- 2 large carrots, diced into 0.5cm cubes
- 2 red or green bell peppers, sliced
- 1 tin of green peas
- 1 packet of tomato sauce
- 400g tofu, cubed (instead of the traditional sausages or chorizo)
- water
- 4 portions of fast-cooking rice

1. Heat the olive oil and add the carrots.
2. After 10 minutes, add the peppers.
3. Fry the peppers thoroughly (for at least 10 minutes), add the tofu and fry until golden-brown. Add salt to taste.
4. Add the tomato sauce and stir carefully. Fry for 13-15 minutes.
5. Mix in the rice and green peas.
6. Gradually add water until the rice is well-cooked.
7. Take the dish off the heat and let it rest for 5 minutes.
8. Enjoy!

Elena Olivera Begue
MSc student of Environmental Sciences from Spain

Which dish reminds you of home? Share it with *Resource* and win an Aurora dining voucher worth 10 euros if your recipe is published! resource@wur.nl

UNIque houses

There are student houses, and there are weird and wonderful students houses. In this feature we visit those UNIque student homes.

Louis: 'You don't have to be a Unitas member to live here, but it does make selection easier.'
Jasmijn: 'For years now, the house has only been lived in by members, and it's nice to keep that up.'
Louis: 'The house has been called Je Moeder (meaning Your Mother) for as long as we can remember. Nobody knows why. That stain on the ceiling – "your birthmark" – was already there when I went through the Unitas introduction days 11 years ago.'
Jasmijn: 'Our house is hard to find. You always have to give extra directions. Our address is the same as the pizzeria downstairs, but the door is in a completely different place.'
Louis: 'Down the dark alley, up the stairs and over the roof terrace.'
Jasmijn: 'I get my packages delivered to Unitas, then there's more chance they will arrive.'
Louis: 'Pre-Covid, I would sometimes bring home a *kapsalon* (a takeaway, ed.) when I came back from the pub, but we don't generally get much from the restaurant downstairs.'
Olivier: 'You can sometimes smell a burned pizza here in the living room, which kills your appetite rather.'
Jasmijn: 'It's either the smell of pizza or of cigarettes from the pub next door.'
Olivier: 'Apart from that, the house's location is perfect. When you go home from Unitas you pass Je Moeder and the chances are, you'll hang around.'
Judith: 'When the clubhouse is closed, Je Moeder is usually still open.'
Olivier: 'It might seem small, but with my room, the hall and the roof terrace, you can get quite a lot of people in here.'
Louis: 'I've been worried about the floor at times.'
Olivier: 'It's nice having a roof terrace in the town centre; we enjoy using it.'
Louis: 'And we're not the only ones. A lot of squirrels get onto it. They live in the churchyard next-door.' CJ

'Je Moeder'

Residents:
Jasmijn Laseur, Louis Baeten and Olivier van Woerkens.

UNIque because:
Although Unitas doesn't have its own houses, for years all the residents of this house have been Unitas members.

If you too want your UNIque house in *Resource*, send an email to resource@wur.nl.

From the left: Louis, Jasmijn and Olivier. ◆ Photo Guy Ackermans

Colophon

Resource is the independent medium for students and staff at Wageningen University & Research. *Resource* reports and interprets the news and gives the context. New articles are posted daily on resource-online.nl. The magazine is published every fortnight on Thursday.

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In love

‘I am in love with my best friend’s girlfriend. We spend a lot of time together in our group of friends and I find it increasingly hard to see so much of her, but I don’t want to lose my best friend. What should I do? Should I be honest about it or should I just keep out of the way?’

W.F., student
(name known to the editors)

Bromance before romance

‘Tricky situation for you! You don’t want to lose your best friend of course, but this is impossible. It might be sensible to step back and spend time with other people instead. Hopefully you’ll soon discover that there are other nice people in the world, and you can let go of your best friend’s girlfriend. Only you can tell whether you should tell your best friend the real reason why you are temporarily withdrawing. After all, “bromance before romance”!’
Ilse Rodermond, video marking specialist

Start dating

‘What an unpleasant, difficult situation for you. I suggest you share your feelings with your best friend; that will be a huge relief. If he’s a really good friend, he will be supportive and maybe not bring his girlfriend along so often when you get together. And do something about it yourself too. Look for someone who is single to date: there are other fish in the sea. Good luck!’
Carolina Castagna, Master’s student of Development and Rural Innovation

One to one

‘My advice is to let sleeping dogs lie: don’t say anything about it to your best friend or his girlfriend. Maybe it’s an idea to meet your friend on his own over the next few weeks or months? There’s a good chance your feelings will die down if you don’t see his girlfriend for a while. As soon as you notice that you don’t feel as strongly about her, you can arrange to meet as a group again, of course. And who knows, in the meanwhile you might meet another nice girl.’
Anke de Bruijn, chair groups editor

Suppress it

‘To me, friendship is very important, more important than being in love. Don’t just pull out of the friendship group. Personally, I would try to keep these feelings to myself, however difficult that may be. Then you will keep up the friendship with your best friend and the crush might cool down. Don’t forget that time is a great healer.’
Hyon Mi Mu, Bachelor’s student of Biotechnology

Ice-cold

‘If I were you, I would try to set aside my love. If you can’t do that, your friend and his girlfriend will soon realize something’s up. If that happens, take a step back and perhaps your feelings will slowly ebb away. If they don’t, you could try this method: soak your feet in ice-cold water while you deliberately think about your crush. That’s a way of associating her more or less unconsciously with an unpleasant feeling. I don’t know whether it really will cure you of being in love, but it’s worth a try. Good luck!’
L.H., Bachelor’s student of Nutrition and Health

NEXT WURRY

Alcohol

‘My housemates and I have agreed to do a Dry January, but I succumbed on only day 3. Without any alcohol I couldn’t sleep and could hardly concentrate. I was so desperate for a drink that I made up some story and cycled to the wine shop. I don’t dare admit it to my housemates but I can’t seem to keep off the bottle. Do I have a drink problem and if so, what should I do about it?’

G., Master’s student
(name known to the editors)

Do you have advice or tips for this WURrier? Or could you use some good advice yourself? ***Email your tips or your question (100 words max) by 24 January to resource@wur.nl*** *subject noWURries.*