

Annual report 2019



Contents



Part 1 Impact | 4

Foreword **3**

Introduction **5**
In conversation **7**
On the agenda **12**



Part 2 In the spotlight | 16

Digital society **17**
Knowledge ecosystems **20**
Knowledge for democracy **24**
Making perfect lives **27**
Science in figures **30**



Part 3 Publications and figures | 33

Reports **34**
Other publications **38**
Annual personnel report **43**
Annual financial report **44**
Board **45**
Programme Panel **46**

Layout: Jacob & Jacobus

Photo previous page: A drone flies just above a street in Utrecht. At the bottom of the drone hangs a camera filming the passing cyclists.

Photo: Stijn Rademaker / Hollandse Hoogte

Anna van Saksenlaan 51, The Hague | Mailbox 95366, 2509 CJ, The Hague | 070 - 342 15 42 | info@rathenau.nl | www.rathenau.nl

Foreword

You have before you the annual report of the Rathenau Instituut. I have been chair of the board for six years, but every year I learn more about the rapid developments in science, technology, and innovation. And about their influence on society and the choices they put before us. Even when it comes to my daily life. I recently wanted to buy a new mattress. When I was asked to use an app that collects data to monitor my sleeping behaviour for tailor-made advice, I thought about it twice. Much more than before, I see the societal impact of technology and innovation on our lives.

It is becoming increasingly complex to make decisions about the opportunities offered by technological innovation. They make our lives easier, but at the same time we have little insight into the world behind the application. What happens to your data? How do you select reliable sources between colored search results and fake news? And what impact does this have on democracy, here and globally?



'Because of my work for the Rathenau Instituut, even more than before, I see how technology and innovation influence our daily lives and work.'

Photo: Rogier Veldman

It is important to provide tools with which people can make conscious choices and have a say in the matter. This requires comprehensible information for all levels of knowledge in society. It is important that people develop their own vision. The Rathenau Instituut supports this by offering politicians, stakeholders, and citizens perspectives for action so that they can form their own opinions and make choices for the future.

It is not always easy to stimulate debate about innovations that concern us all, or put them on the agenda, even if they still seem far away. This can only be done by working together internationally and charting the possible consequences of developments before they land on a large scale in society. In this way we can ensure that policy and existing frameworks are adapted where necessary - with shared values as the starting point. Even if we sometimes have to redefine those values together.

Last year we worked with our partners on the debate about innovations in healthcare. With our research into virtual reality, which is on the verge of breaking through, we put the protection of consumers on the agenda. In a consortium, together with doctors and patients, we started a national dialogue on the future of birth, disease, and health and whether it would be desirable to modify human DNA. In order to get a better grip on the many developments surrounding artificial intelligence, the Lower House initiated a Committee on the Digital Future, which supports the Rathenau Instituut in terms of content. We were also involved in the national digital strategy and the first Dutch Digital Summit, the Netherlands Digital Conference, which will be held in March 2020. These are valuable developments. In Europe, we had an active input on the European strategy in the field of AI.

For 2020 I want to encourage everyone to keep talking to each other, across bubbles and borders. And above all, to ask the right questions. The Rathenau Instituut is committed to building a society in which science, technology, and innovation are at the service of all of us.

Gerdi A. Verbeet

Chair of the board of the Rathenau Instituut

Part 1 Impact

Through the media, during debates, and by putting subjects on the political agenda, our research in 2019 stimulated social dialogue on science, technology, and innovation. In this section you can read about how and where we did this.

The Hague city centre streetscape

How do we ensure that people are at the centre?

The Rathenau Instituut supports public and political opinion formation on science, technology, and innovation. In 2019, director Melanie Peters saw a growing awareness that the discussion is not about scientific or technological developments themselves, but about the question of what kind of society we want to live in.

Technology is about us

In 2018, Mark Zuckerberg was interrogated by the U.S. Congress. But whether that interrogation was successful, I doubt it. The members of Congress did not have enough knowledge and insight to be able to question the founder of Facebook critically about the way in which the company deals with the data of and about its users. The hearing in the US Congress took place after the revelation of the Cambridge Analytica scandal. This consultancy turned out to have collected and used the data of 87 million Facebook users, without their consent, for political advertisements in the run-up to the 2016 presidential election.

Worldwide, including in the Netherlands, the interrogation of Mark Zuckerberg has awakened politicians. Do we actually have enough information to ask the right questions in the development of technology? Or are we staring blindly at the latest technological possibilities, while we have no eye for their impact on our society? If we want to understand what technology means to us, we must not forget to look at ourselves as well. Based on what values do we build technological solutions? And how does our use of the latest innovations relate to values we all consider important, such as transparency, privacy, or solidarity?

In 2019 I saw a growing awareness that technology is about all of us - as individuals and as a society. A highlight for me was the Netherlands Digital Conference in March 2019. Here, parties from business, science, government, and community organisations discussed the digital transition together. The cabinet then published the Dutch Digitalisation Strategy in July. It is important that all ministers have a joint strategy, because questions like "Who owns this data? And what do we do with it?" plays a role in every ministry, from education to health care to taxation.

Human face

Already in 2018, the Rathenau Instituut advocated the right to meaningful human contact and the right not to be monitored. Because whether we use technology for our health, at work, or in a virtual world as a leisure activity, we feel that technology changes the relationship with our environment. I also read this awareness in the Strategic Action Plan for Artificial Intelligence, published by the Cabinet in October 2019. An important question taken from this plan is: 'How do we ensure that people remain central?' Last year, the Rathenau Instituut carried



Director Melanie Peters: 'Again and again we look for technology with a human aspect.'

out research for the police into the use of sensors for quality of life and security. Civilians appeared to be able to indicate well when they find body-cams on police officers or cameras on the street acceptable and when not. They thought about it in a nuanced way and weighed different values, such as security and democratic rights, against each other.

In 2019, the Rathenau Instituut also explored with and for municipal councils, clerks, mayors, and the Province of North Holland how they can use technology to improve services, strengthen local democracy, and meet societal challenges. Time and again we looked for a digital government and politics that not only revolve around efficiency and innovation, but also around values that give technology a human aspect.

Research and dialogue

Last year, our tour of ministries showed that they have difficulty in acquiring knowledge and asking the right questions for policy-making. This is at odds with the fact that today we expect policymakers to strive for a well-informed policy (evidence based policy). Through research and dialogue, the Rathenau Instituut contributes to asking the right questions about developments in science, technology, and innovation. For example, we support the formation of public and political opinions.

In 2019, for example, we drew up lessons for a social dialogue on the modification of hereditary DNA in embryos. Technology creates more and more possibilities. This requires a discussion about what is possible, what is allowed, and what is desirable. With our research, we facilitated this dialogue. So that the right questions are addressed. What is allowed at this moment? What is possible? Who benefits from it? Who pays? What uncertainties are there? And what visions on this theme exist in society?

We also started a project in which we investigate how society can talk about the final disposal of radioactive

waste. How do you conduct a dialogue on this sensitive subject? And what exactly is it about? In short, here too the question is: 'How do we ensure that we ask the right questions?' This concerns technical questions about radiation and the subsurface, or social questions such as who is responsible for our health in relation to radiation.

At our Rathenau Live meeting in November 2019, we heard from the American author Clive Thompson that asking the right questions for programmers is not so easy. He described the world of this influential profession in his book *Coders* (2019). Programmers are given little room to build on digital technology from an ethical framework. One of the reasons for this is the financial model on which social media companies are built. Investors want to know whether their investment is worthwhile in the short term. This is an incentive for programmers to let algorithms display the most spectacular messages - that generate the most clicks - online. However, programmers also have to take responsibility for the way IT is used. Whoever has knowledge, must act accordingly.

Finding solutions

Asking the right questions starts with being able to do independent research. That is why the Rathenau Instituut underlined the importance of the independence of universities in 2019. We must safeguard that independence. One way of doing this is by investing in the digital infrastructure of knowledge institutions, so that they do not make themselves dependent on large technology companies.

Geopolitical reality is changing, but we also face major social challenges in our own country. I am confident that science, technology, and innovation can help us find solutions, provided that we do not forget ourselves; we must put people at the heart of our concerns. Because when we focus on technology and knowledge, we forget to ask ourselves what kind of society we actually want to live in. And that is the most important and, for me, the most interesting question.

Stay up to date

Via our newsletter: rathenau.nl/nl/nieuwsbrief and via  Twitter,  LinkedIn,  Facebook and  Instagram

In conversation



Question from the audience during 'Rathenau Live' with tech journalist Clive Thompson on 7 November 2019.

The Rathenau Instituut puts the impact of science and innovation on society on the agenda by researching new developments. We discuss this with various stakeholders, professionals, citizens, fellow knowledge institutions, politicians, and civil society organisations. Through our online channels and live meetings, we involve as many relevant groups as possible in the debate about the societal place of technology and knowledge development. In this annual report we show where we conducted this dialogue in 2019. The Rathenau Instituut traveled the country for debates, presentations at festivals, and contributions to congresses. We also attended expert meetings of public and private organisations in the Netherlands and abroad, meetings in the Upper and Lower Houses of Parliament, and in parliaments in Europe and beyond.

In conversation with politics and society

The Rathenau Instituut in figures:



Who's at the wheel?

Discussing responsible digitisation with Clive Thompson

On Thursday 7 November, tech journalist Clive Thompson talked about digital technologies and how we can stay 'at the controls' ourselves. The reason for inviting him was his book *Coders*, in which he gives an insight into the world of programmers. In the Koninklijke Schouwburg The Hague he spoke in front of a full auditorium during Rathenau Live, our institute's annual meeting for stakeholders.

Research done by the Rathenau Instituut shows how digitisation affects our lives. That influence encompasses much more than a collection of gadgets. We can now speak of a digital transition. In order for everyone to be able to participate, the government, technology companies, umbrella organisations, and we ourselves must act in unison. Politicians and policymakers must provide clear frameworks, so that it is clear, for example, what a company like Facebook is: is it a technology or media company or a publisher? Is the existing regulation appropriate and how does it protect our public values? In addition, supervisory bodies must cooperate intensively. But it's at least as important that citizens have the skills to help decide on the digital society of the future.

Programmers must also take responsibility. Clive Thompson showed why 'coders' often have little regard for the impact of their work. Efficiency is not a virtue in



Rathenau researcher Linda Kool in conversation with Clive Thompson.

itself, but is highly valued by the remarkably uniform professional group, according to interviews he conducted. Thompson: 'Coders are extremely good at tackling complex problems and finding solutions to them.'

It's not for nothing that process optimisation is the basis for just about all major tech companies, such as Google, Uber and Facebook'. That optimisation turned out to have side effects that programmers hadn't thought. Decisions based on algorithms at big data companies regularly clash with public interests. Programmers need to incorporate public values directly into their work. Fortunately, he sees that awareness is also increasing within the sector: 'Changes to more responsible digitisation seem imminent'. In this way 'coders' also contribute to a responsible digital society.

More grip for court clerks

7-9 October, Knowledge festival
Municipality of Leeuwarden

With the Leeuwarden Digital Agenda, the municipality wants to link digitisation to social tasks. As part of this, a Knowledge Festival for councillors and civil servants took place at the beginning of October. The Rathenau Instituut provided input based on the report Griffiers en Digitalisering, with a presentation by Bart Karstens.



Choosing healthy and sustainable food

6 May, It's the Food, my Friend - Amsterdam

How can we make sustainable choices easier and more attractive? That's what the recent debate of It's the Food, my Friend, an annual series in de Rode Hoed, was all about. The Rathenau Instituut was partner of this event. Petra Verhoef was one of the speakers.



Lessons on online civic participation

4 November, Nieuwegein

In November, the first Participation Day took place, where professionals from practice and science met. At this initiative of the ministries of IenW and BZK, together with Overlegorgaan Fysieke Leefomgeving, Paul Diederik organised a workshop on digital citizen participation.

Meet our artist-in-residence

4 & 5 November, Brave New World festival - Naturalis Leiden

Jeroen Gouman spoke at Brave New World about ethical issues surrounding human-animal combinations. Artist-in-residence Roos Groothuizen playfully allowed visitors to reflect on the impact of digitisation with her game Cycle, Recycle, designed for the Rathenau Instituut.

Tools for mayors

Spring, Dutch Association of Mayors - Lochem

Dutch mayors meet six times a year at the Lochem Conferences. Romy Dekker, Linda Kool, Rinie van Est, and Jurriën Hamer offered tools from our research Valuable Digitalisation to work on the information society.



Biotechnology Student Competition

13 & 14 June, iGEM meet-up – The Hague

Since 2011, student teams in the global iGEM competition have been working annually on societal issues in the field of modern biotechnology. Together with RIVM, we organised a meet-up in which European teams prepared for the iGEM finals in Boston.

From community centre to festival: talking about DNA

October and November 2019, National DNA-dialogue - Rotterdam & Nijmegen

On 19 October, the national DNA dialogue was launched in Rotterdam: a series of national meetings on the permanent adaptation of human DNA. In November, we held a public workshop on this subject during the InScience festival in Nijmegen.



Digital transition in the province

11 July, Presentation Data doorzien - Provincial Building Haarlem

For the province of Noord-Holland we worked on the study 'Data Doorzien. Ethiek van de digitale transitie in de Nederlandse provincies'. On Thursday 11 July, director Melanie Peters presented the final publication to Arthur van Dijk, the King's Commissioner in the Netherlands, in North Holland.



Network for Parliamentary Technology Assessment

4 - 6 November, EPTA-conference - Bratislava

At the beginning of November we met our sister institutions at the fourth European Parliamentary Technology Assessment Conference. The Global TA Network was established on the spot. Rinie van Est and Melanie Peters discussed the rules of the game for that network.



Ethical biotechnology

31 October - 4 November, iGEM Jamboree - Boston

At the end of October, the iGEM final took place in Boston, where international student teams competed for the best project on modern biotechnology. The Rathenau Instituut, in the person of Lilian van Hove, participated in the jury committee that evaluates projects on ethical aspects.



Care for care in Sveriges Riksdag

10 & 11 October, Stockholm

In October, the institutions of the EPTA network published their report 'Technologies in care for older people', about care innovations and the use of digital technology in elderly care, with experiences from different countries. The report was presented to the Swedish Parliament at this meeting.



Research and policies for a better world

5 - 7 June, EU-SPRI - Rome

Every year the EU-SPRI conference takes place in a different European city. This time, the meeting of the European forum for research and innovation policy focused on the Sustainable Development Goals. Seven Rathenau colleagues hosted a workshop.

Public involvement in science

8 - 10 July, Cambridge

How can stakeholders be involved in research from the outset? From 8 to 10 July, professionals immersed themselves in the do's and don't's of public engagement during a master class in Cambridge. Pieter van Boheemen talked about experiences with 'leadership in public engagement'.



Who's the boss at home?

11 June, Oslo

In Oslo, Dhoya Snijders gave a presentation on the Internet of Things at the RELINK startup conference. Smart households combine convenience for users with control over what happens to their data. The Rathenau Instituut is a partner in this European project.



Impact of large-scale research infrastructures

19 June, working visits ACCELERATE, Szeged

In 2019, Leonie van Drooge and Isabelle van Elzakker paid a working visit to European research infrastructures in the context of ACCELERATE, a EU project in which we are partners. In June the partners met at the ELI Attosecond Light Pulse Source research facility.



European focus on 'perfect' plants

7 & 8 November, Brussels

In Brussels, the European Academies of Sciences met on 7 and 8 November in order to talk about the scientific and social values of genetic modification in plants and crops. Michelle Habets spoke about appropriate frameworks for regulation.

In the media

World-class science

'In 2016, the Netherlands was in the top 5 of countries with the highest citation scores in all scientific areas. Since 2003, Dutch science has developed most strongly in the fields of Health, Behaviour & Society, and Economics. In those areas of science, the citation impact and the relative size of the number of publications increased. This is apparent from an analysis by the Rathenau Instituut.'

National Education Guide, 6 February 2019 \ about development of the scientific research profile of the Netherlands

Economic impact

'In the past, studies have been carried out into the impact of scientific research in the field of agriculture, for example. Sometimes very precise amounts come out of these studies. But the Rathenau Instituut [...] concludes that calculations are largely based on assumptions. It is not so easy to determine whether the euro invested in science also pays for itself in sound currency.'

Farm, 7 February 2019 \ about Eieren voor het onderzoek. Prijs, waarde en impact van wetenschap

Gentech

"'Because new techniques are more accurate than the old ones, it is often said that they are safer,'" says researcher Michelle Habets of the Rathenau Instituut. "Accurate is translated one-on-one with safe." There's no proof of that yet, according to the instituut.'

Het Financieele Dagblad, 29 April 2019 \ about Genome editing in plants and crops

Particle accelerators and space telescopes

'The Rathenau Instituut has developed a calculation model to make a global estimate of the return on investment for the Netherlands of large international research infrastructures.'

ScienceGuide, 2 May 2019 \ about De impact van grootschalige onderzoeksinfrastructuren

Sensors for safety and quality of life

'The research shows that citizens do not want to feel that they are constantly being watched. Enough thought also needs to be given to the security of personal data and how these are used. 'Citizens think about it in quite a nuanced way', says Melanie Peters, director of the Rathenau Instituut.'

NOS, 11 September 2019 \ about Citizens and sensors

Trust

'Research by the Rathenau Instituut among approximately 140,000 Dutch people also shows that of all the institutions, the Dutch still have the most confidence in science, well above the judiciary, media, and politics. Between 2015 and 2018, this trust even increased slightly.'

RTL News, 28 September 2019 \ over Vertrouwen in de wetenschap

Virtual world

'Virtual reality immerses users so deeply in a virtual, deceptive reality that they need to be better protected against the excesses. That is what the Rathenau Institute states in the report Responsible virtual - Protect consumers in virtual reality.'

NRC Handelsblad, 20 November 2019 \ about Responsible VR

DNA

'The distinction between curing and improving is therefore important in the 'assessment of acceptability', concludes the Rathenau Instituut in a report on DNA modification.'

Nederlands Dagblad, 7 December 2019 \ about Discussing the modification of heritable DNA in embryos

On the agenda



Legislative consultation with Minister Van Engelshoven on the 2020 budget of the Ministry of Education, Culture and Science, section culture.

Photo: Dirk Hol / Novum RegioFoto / Hollandse Hoogte

Politically, 2019 was an active year for the Rathenau Instituut. Once again, we supported the political debate on the impact of science, innovation, and technology on society. Through Messages to Parliament, we provided politicians with solicited and unsolicited information based on our research. We provided input before and during technical briefings, round-table discussions and AOs (General Consultations) in the House of Representatives. Our publications were regularly referred to directly and indirectly. By means of our reports on options for action for parliament, ministries and policy, we also aimed to help politicians weigh up their options. The following pages give an impression of our contributions to supporting the political debate.

416

Total number of references in all official documents

122

Number of Memoranda or reports to Parliament referring to Rathenau Instituut publications

45

Number of parliamentary debates with Rathenau Instituut's output used in argumentation

Reactions from government

Research by the Rathenau Instituut in 2019 led to many questions from members of the House of Representatives for a response from the government. After publication of our research *Kennis in het vizier* on defence research and the Dutch public knowledge infrastructure, the government decided to adopt the findings. We were also asked to explain this research report in a technical briefing in the House of Representatives. Also at other meetings of the House of Representatives in the past year we had written or oral input, such as through a technical briefing on our research into the impact of large-scale research infrastructures, such as particle accelerators and how they promote science - and especially how this impact can be understood.

Following research by the Rathenau Instituut, Parliament decided in 2019 to set up a temporary committee on digitisation. In response to our report **Responsible VR** about the protection of consumers against health and other effects of virtual reality, the government asked for further research. In February, the House of



Technical briefing in the House of Representatives on 10 October 2019, about our research 'Kennis in het Vizier' and 'De impact van grootschalige onderzoeksinfrastructuren'.

Representatives organised a conference on the (economic) value of science, as a result of our research. In June, the Department of Analysis and Research of the House of Representatives organised a meeting on blockchain and the questions that this development raises for the political world.

'The question is: how do you, as a society, reap the benefits of knowledge?'

Rathenau researcher Jos van den Broek in 'Als universitair onderzoekers de markt opgaan', de Volkskrant, 2 February 2019

In the political arena

The research of the Rathenau Instituut appeared frequently in the political arena in 2019. An overview.

'Digitisation of data means that health is no longer under control'

Member of Parliament Hijink on our report *Gezondheid Centraal* (Health at the Centre) in January: 'This is how the Rathenau Instituut confirms that the large-scale collection of all health data of all Dutch citizens in one standardised system is not useful and is doomed to failure. The Rathenau Instituut also makes it clear that digitisation will not enable all users to get a better grip on their health.'

'I want it to happen safely'

Minister Bruins on our *Health at the Centre Report* in January: 'The Rathenau report speaks of concern about the loss of control. I think I said in the first part of my speech that I want it to happen safely. I think that's also an important element for the upcoming law. After all, an unbelievable amount of time is spent on exchange, logistics, information process, asking and answering the same question 140 times over. So we have to find a way of working that is practical for the professionals and safe for the patient. That in response to the report.'

'Reliability of policy support research is shared responsibility'

Minister Grapperhuis responded to the *Met gepaste afstand* report in March: 'The Rathenau report concludes that the reliability of policy-supporting research is a shared responsibility of the knowledge institution and the ministry. Together they must find a healthy balance between independence, distance, and involvement, proximity. The report also observes that you need to have good assurance instruments with a good mix of hard methods of assurance such as a sufficiently solid position regulation and soft instruments; these are really the training courses in professional behaviour. The package of measures that I reported to you in my policy response covers both types of measures.'

'With big data, Internet of Things and AI fundamental rights can be at stake'

Minister Ollongren wrote in March in a parliamentary letter on algorithms and fundamental rights: 'The development and application of new (digital) technologies have always brought opportunities and risks. Many studies have been published on the subject, including the report *Urgent Upgrade* commissioned by my ministry of the Rathenau Instituut in 2017. Big Data, Internet of Things and Artificial Intelligence are important drivers of this process of digitisation and can significantly affect daily life. As a result, the protection of fundamental rights may also be at stake. In addition to the Rathenau Instituut, other commissions and institutes should also be aware of this.'

'Industry and society not equipped for new demands digitisation'

MP Mrs. Fiers on our report *Urgent Upgrade* in June: 'The far-reaching digitisation of society raises fundamental ethical and social issues. Government, business life and society are not yet adequately equipped to deal with these new questions. In view of these conclusions of the Rathenau Instituut, the Usage Passenger Data Act deserves our full attention.'

'A digital passport for every pig'

Schouten in September about our report *Digitaliseren van dieren*: 'The application of ICT technology in animal husbandry to promote animal welfare we already support through the top sector policy. The first proposals for research have already been submitted. Sector parties are also working hard on this. For example, we are working on a digital passport for every pig.'

'In a way an eye-opener'

Member of Parliament Van Ojik about our report *Kennis in het vizier* in October: 'From the report of the Rathenau Instituut - which was an eye-opener for me in a way - I understood that it is now the case that national research institutes and universities all have their own protocols and rules for doing research. Couldn't there be a lot more national policy on that? In fact, the Rathenau Instituut recommends that.'

'Adjusting rules when virtual technology makes a breakthrough?'

Following the report **Responsible VR** In November, Members of Parliament asked the government in a motion to investigate 'whether the expected breakthrough of virtual technology should lead to adjustments of the existing regulatory frameworks and legal regulations, and to inform the House of Representatives accordingly'. Minister Dekker responded: 'I was able to browse through the report and actually ask what the effects are of the new technological developments towards the future. Here we are asked to examine what this could mean for legislation. I can deal with that very well and therefore leave the judgement to the House of Representatives'. The motion was carried.

'Appreciation for report on internationalisation'

Member of Parliament Moorlag about our report **Verstandig internationaliseren** in November: 'Now the Rathenau Instituut, in itself a renowned institute, has given us another document addressing the importance of internationalisation of the whole knowledge agenda and knowledge sharing. My question to the minister is whether she would like to embrace this. But if she says she wants to take it a little further, is she willing to send an appreciation of the Rathenau Instituut's paper to the House of Representatives?'

'Viewing one's own health data and consenting to sharing thereof requires digital skill.'

The Rathenau Instituut in 'Patient confidentiality alone does not guarantee privacy', Trouw, 23 April 2019

Part 2

In the spotlight

From cyber conflict to e-health and from open science to innovation policy: in this section you will read for each theme what we investigated in 2019.

Grandmother and granddaughter train in the park with a smartwatch.
Photo: Uwe Umstätter / Hollandse Hoogte

How do we use digital technology for societal challenges?



Primary school students demonstrate their work on tablet computers. Photo: Thomas Frey / Hollandse Hoogte

The difference between online and offline is blurring. What we do online has an offline effect. Digital technologies are used in all areas of society - from education and care to security and governance. The Rathenau Instituut investigates the impact of the digital transition on our lives and how digitisation can provide opportunities for societal challenges.

Responsible digitisation in the data society

Energy control, consumer protection, and commitment to cyber peace

Energy transition

The Netherlands faces the challenge of making its energy supply more sustainable. The Energy Act stipulates that energy must be reliable, affordable, safe, and clean. As a result, there is an increasing demand for sustainable energy sources, such as solar, wind and rechargeable batteries. The generation of this energy is often decentralised by citizens or neighbourhood cooperatives themselves, making it more difficult to match supply and demand. The Rathenau Institute sees that digitisation is necessary to make the energy transition a success. Digitisation makes it possible to collect, analyse and adjust data on energy production, transport and consumption in real time.

But digitisation of the energy system also means that new players, such as large technology companies, will have an influence on the energy supply. And it will be possible to make money from data on energy. If an algorithm predicts undercapacity, it is conceivable that the price of energy will rise. This raises social, ethical, and political questions about, for example, the reliability, affordability or accessibility of energy. Do we have the knowledge and skills to maintain control of our energy system, which will increasingly become an ICT platform?

During the round table discussion on Grid Capacity and the General Debate on Climate and Energy in the House of Representatives in November 2019, we asked for attention to be paid to the challenge of managing energy data from a public utility perspective, so that clean, reliable, safe, and affordable energy remains available to everyone. We discussed the role of the provincial government in the digital transition, including that of the energy system, in Data Doorzien. We wrote this study, published in July 2019, at the request of the Province of North Holland. Digitisation of the energy system may seem a matter of technology, but today's decisions determine the future of our energy supply.

Immersion

In September 2019 we published **Responsible VR**. The Rathenau Instituut carried out research into the social

significance of virtual reality. (VR), a so-called immersive technology. VR immerses the user in a digital world by shutting off their senses from the outside world. Large high-tech companies, such as Facebook, Google and Microsoft, have invested billions in its development. More and more applications are available worldwide and in the Netherlands, and VR glasses are becoming affordable for consumers.

Our research showed that scientists, technology journalists, but also the sector itself, are concerned about the use of VR by consumers. These concerns relate, for example, to intimidation in the virtual world or addiction to games. We raised the question of whether VR is so invasive that it should be regulated as a medical technology. Because what happens online has an offline effect. But more research into health effects is needed.

In addition, technology companies use VR to collect even more personal data than they already do, such as movements and facial expressions. That is why the Rathenau Instituut called for more consumer protection. It needs to be clarified whether and how companies are allowed to use this data and what existing regulations, such as privacy legislation and consumer law, mean in the virtual environment.

Cybersecurity

In 2019, cyber security was one of the issues determining global relations. In **Cyberspace without conflict**, we investigated how more and more countries are carrying out cyber attacks that cause major damage to companies, people and government institutions. Virtually all countries also use these cyber weapons. We concluded that the Netherlands can play a central role in counteracting international cyber threat. With its open economy, the Netherlands has an interest in de-escalating this conflict. Moreover, with its long tradition of peace negotiations and diplomacy, the Netherlands has a position in which it can intensify international cooperation.

Dutch people have a nuanced view on sensors for safety and quality of life

When to use technology or not?

The Netherlands has more and more sensors to improve quality of life and safety. The police also use sensors, such as bodycams or WiFi trackers, which can be used to map crowds on the streets. Together, these sensors collect enormous amounts of data.

At the request of the police, the Rathenau Instituut carried out research into citizens' opinions on this use of sensors. In *Citizens and sensors*, the Dutch do not appear to be either for or against it. It is mainly due to the situation. They find the use of sensors by the police more acceptable the more crowded or unsafe a situation in public space is. Important values for citizens are not only security and privacy, but also democratic rights, transparency, efficiency and human contact. Citizens do not want the use of sensors to be at the expense of blue on the street and are outspoken about where sensors may or may not be used.

On the basis of our research, we drew up eight ground rules for the use of sensors by the police. These rules are used in workshops inside and outside the police force and in discussions about the responsible use of sensor applications. The insights from the research will also be used for a new Masterclass Concept development within the police organisation.



In the Netherlands, sensors are increasingly being used to promote safety and quality of life.

Photo: Wouter Roosenboom Fotografie / Hollandse Hoogte

'You sometimes get the impression that a lot of people handle their private data easily and think: it's not all that important. That image is not correct.'

Theo van der Plas, programme director digitisation and cybercrime for the police, on the Rathenau investigation 'Citizens and sensors', Trouw, 11 September 2019

How do we develop knowledge for the future?



Urban Farmers - Growing vegetables and fish in an office building in The Hague.
Photo: Joost Bataille / Hollandse Hoogte

Societal challenges call for new knowledge. Think of the transition to a sustainable energy supply or a circular economy. For our knowledge society it is important to know how this knowledge is best generated. The Rathenau Institut is therefore mapping out the broad Dutch knowledge and innovation landscape. Universities, universities of applied sciences, knowledge institutions, companies, and new forms such as living labs are important in this respect; together they form 'ecosystems' around challenges and fundamental issues. How can these knowledge ecosystems function properly? How do we ensure that research is equipped for future questions and what policy is needed?

Societal challenges call for new cooperation and strategy

Guidance towards preconditions for independent research

Research by the Rathenau Instituut shows that confidence in science is high and the level of Dutch science is high as well. In international rankings, Dutch universities are in the top 100 in virtually all research areas. The impact of the research is multifaceted and universities attract many domestic and foreign talent. Our society and economy depend on scientific insights and the development of responsible technology. Certainly in view of the challenges of our time - such as living in a delta while the sea level rises - the importance of knowledge becomes clear.

In order to respond to social questions, science is needed that receives signals from society. Knowledge institutions must find a balance between education, research and knowledge utilisation. Research at universities of applied sciences has a new and important role to play here. In 2019, we carried out research into this for the SIA governance body. In **Bouwen aan krachtige onderzoeksgroepen** we give a viewpoint on research at colleges of higher education with value for society. For example, when it comes to how students in the performing arts can remain fit and healthy during their future careers. In order to maintain the quality of practice-based research, cooperation with professional practice, but also good data management, among other things, is important. These are prerequisites for quality.

Importance of guidance and strategy

With our research into knowledge development, we want to present options for future-proof policy on the social value of science and support the political decision-making process in this area. Many of our focal points were reflected in the new Strategic Agenda for Higher Education of December 2019. For example, it discusses the power of collaboration between universities of applied sciences and universities of applied sciences, and between disciplines. Our research also shows that education needs to be valued more; students must be trained with skills that our future society demands. To this end, the Minister and the sector itself must continue to invest in order to safeguard the public function of higher education.

Developments in the outside world constantly demand new thinking about the organisation of research and education. For example, in the field of digitisation. For Parliament, we formulated five points for attention in the increasing use of digital resources in higher education, among other things to ensure that attention is paid to values as privacy and digital security, but also justice and the autonomy of lecturers and students must partly be redefined through digitisation.

Investing in public infrastructures for knowledge development

Our research shows that universities need to work more intensively on a secure infrastructure, for example when it comes to access to research data and publications. Investment in, for example, university libraries and data storage is needed to ensure that digitisation is on the right track. As a pioneer in Europe, the Netherlands could then contribute to the true ideal of open science: sharing knowledge in a responsible way so that we can all reap the benefits. Without data getting into the wrong hands.

Not only do universities have to deal with new forms of (cyber) espionage by companies and states. Campuses are also the place society is looking to for measures against these threats. We investigated this in **Kennis in het vizier**. New assessment frameworks and procedures are needed around knowledge development and access to results in order to responsibly shape research that both intentionally and unintentionally relates to defense and security. On request, we explained this research during a technical briefing in the House of Representatives.

The social context in new forms of knowledge development

Knowledge development is crucial, but requires appropriate frameworks and policies for knowledge institutions to steer their own course and to be able to enter into strategic alliances. Especially now that new knowledge ecosystems are emerging. We are seeing increasing interest in regional cooperation among all kinds of public and private parties. In living labs, on campuses, and in other multidisciplinary contexts, parties are working together on specific knowledge and technology areas. In our research we try to better understand the dynamics of such local knowledge ecosystems.

At the request of the National Institute for Public Health and the Environment (RIVM), we carried out research into the social embedding of new knowledge and innovations and how knowledge institutions can anticipate this. In **Voorbereid op de praktijk**, we offer, on the basis of 33 analysed examples, tools to steer innovations at an early stage towards a good 'landing' in society. After all, the success of an innovation always depends on its interaction with the social environment. By continuing to keep an eye on that context, our society can benefit from new knowledge.

'Whether we like it or not, in cyber conflict we all play a role.'

Rathenau researcher Jurriën Hamer in 'Digitaal wapengekletter is een gevaar voor onze veiligheid', Trouw, 11 September 2019

Innovation policy needs innovation

In mission-driven innovation policy there must be room for customisation and experimentation

Sustainable food supply for a growing world population, the responsible embedding of digitisation in care: as a society we face different challenges that affect us and future generations. In order to address these issues, politics, business, civil society and science must act together. In addition to cooperation, innovation policy with clear missions is indispensable.

In 2018, the government took an important step by focusing innovation policy on major societal challenges. Research by the Rathenau Instituut, such as Kennis voor beleid in beeld, shows that this policy is still too similar to the promotion of entrepreneurship and existing types of public-private partnership, and too little focused on the social embedding of innovations. This is a promising first step, but on a number of points the policy itself still needs innovation. In 2019, we investigated what is needed to make the mission-driven innovation policy successful. Incidentally, this policy stands alongside classic innovation policy that has its own function.

Previous experiences with mission-driven innovation policy show that there should be room for customisation. Important elements of such an approach are first and foremost open, flexible and adaptive ways of policy and funding research and innovation. In this way, work can be done in the short term on the development of socially responsible transition paths.

This also requires room for experiments in development and implementation of innovation policy, paying attention to an effective division of roles between different authorities.

Knowledge institutions, businesses, users, policy-makers, citizens and societal stakeholders should also be able to experiment jointly with innovative solutions within new knowledge practices, with attention to coherence and continuity, so that projects and local initiatives can build on each other.



Innovative city farm that produces Spirulina, an edible algae that can be used as a protein-rich, sustainable alternative to meat.
Photo: Paola Di Bella / Redux / Hollandse Hoogte

'Determining with certainty the economic impact of scientific investments is too complex a task for science itself.'

ScienceGuide, 5 February 2019 as a result of our research 'Eieren voor het onderzoek'

Knowledge for democracy



The House of Representatives celebrates one hundred years of suffrage in 2019.
Photo: Peter Hiltz / Hollandse Hoogte

Commotion around controversial issues, such as radioactive waste, vaccinations, or biotechnology, shows that democracy can be an exciting game between knowledge, evidence, interests, and values. The Rathenau Instituut uses its experience and expertise with disputed issues to take the social dialogue on these issues further. For example, by sharing knowledge and drawing up rules of the game for an inclusive debate in which different stakeholders are heard.

Maintaining our democracy

Big questions and sensitive decision making

Proof and interests

Are the dikes high enough? Is there a risk of a flu epidemic? How do we control whether our food is produced in a healthy and safe way? These are big questions in our society and for the answers, knowledge is desperately needed. We therefore expect politicians to make policy on the basis of scientific insights. However, this knowledge also regularly comes up for discussion in the event of controversy about disputed issues, such as radioactive waste or biotechnology.

Moreover, knowledge is not just reserved for experts. Digital access to knowledge and information displaces political and social debate to different forums. This forces experts, knowledge institutions and governments to find new forms to develop knowledge for policy. The Rathenau Instituut provides insight into the place of knowledge, evidence, interests and values in political decision-making. This contributes to an evidence-informed policy and a future-proof democracy.

In 2019 we were involved in a number of social dialogues on controversial topics, such as ammonia in agriculture, biotechnology and radioactive waste. In these social dialogues we are in contact with partners in the Netherlands, the European Commission, the OECD and UNESCO. In the project **RECIPES** for example, we analyse how the precautionary principle is used in Europe. We use our expertise to better involve citizens in sensitive decision-making, such as on gene technology and pesticides, involving both scientific insights, interests and different values.

From local to global

The Rathenau Instituut is investigating the role that technologies can play in keeping democracy fit for the future. How can technology be used to involve people more in democratic processes and to strengthen confidence in them? What organisational changes in government - national, international, regional and local - are involved? In June 2019 we published **Griffiers en digitalisering**, on how digitisation is changing the daily work of clerks. Before that, we held

interviews with court clerks and councillors, among others. We did this at the request of the Association of Registrars (VvG) and the Association of Dutch Municipalities (VNG). We researched what is needed to use digital technology in a meaningful way in the work of court clerks, so that local democracy can benefit optimally from digital innovation. For example, we argued that a council information system with a good search function is needed to make the large digital information flow manageable for council members. Attractive websites, convenient use of social media, and live streaming of meetings could be used to involve residents in politics and administration at municipal level. We also gave examples of digital means to obtain more information from outside our own official organisation. All this with the aim that court clerks can better support the municipal council with knowledge and signals from outside, so that citizens are given a more active role

For the future sustainability of democracy, we look not only to the Netherlands, but also to other countries. In October 2019 we set up an international network with partner institutes from Russia and Japan, among others: the **Global Technology Assessment (TA) Network**. That same month, we made a substantial contribution to the **international parliamentary TA conference in Bratislava**.

Public knowledge organisations

For well-informed policy, public knowledge institutions are important, which collect figures on the state of the country and build knowledge for the benefit of policy and the public. The Rathenau Instituut brings public knowledge organisations into the picture. In March 2019 we published **Denktanks voor de democratie**, in which we described exactly what public knowledge organisations are and what services they provide. From CBS, CPB, KNMI and NFI to the Police Academy, RIVM or TNO. **Financiering publieke kennis organisaties**, that we published in November 2019, provided information on the financial trends in public knowledge organisations.

Knowledge for ministries

Well informed policy is a skill

In the 2019 blog series **Hoe komen ministeries aan kennis** we conducted research into how ministries organise themselves to ensure that they have the right knowledge for policy in good time. We did this by means of interviews and dialogue sessions with policy advisers, committees of wise men and public knowledge organisations. Based on our observations and interviews, we argue that evidence-informed policy is not just a question of organising knowledge 'in-house'. Well-informed policy is a skill that requires specific professional skills.

Although we expect management board members to base their decisions on knowledge or well-founded assumptions, the proven (in)effectiveness of a measure says nothing about the (un)desirability of implementing it. In political decision-making there is room for facts and values. Well-informed policy requires politicians and policymakers to be able to make a precise distinction between the factual situation and the normative question and, on this basis, to justify and/or question the choices made. A second skill is the ability to make the distinction between knowledge as a product and knowledge as co-production. For many complex questions (energy supply, sustainability or inequality, for example) it is not clear in advance exactly what is desirable and feasible: what the goal of policy should be, how progress could be monitored, and who should be involved in its implementation.



Governments work together to improve the preventive approach to crime by using data analytics. Governments share knowledge and information and support each other in the use of new methods.

Photo: Robin Utrecht / Hollandse Hoogte

These kinds of issues are not solved with knowledge as a 'product' - a research to order - but with knowledge generated as co-production: a process in which, step by step and in consultation with scientists, stakeholders, citizens and international, national, regional, and local authorities, the necessary knowledge, information, and insights emerge, and each of these actors retains its own responsibility in this.

'Long-term relationships with knowledge organisations offer ministries the opportunity to work on sustainable knowledge building.'

Blogseries 'Hoe komen ministeries aan kennis?', website Rathenau Instituut, 4 September 2019

To what extent can we make our lives perfect?



The humanoid robot 'Pepper' in a German nursing home.
Photo: Boris Roessler / Hollandse Hoogte

Developments in biotechnology and medicine, such as e-health and DNA modification, make social questions about the manufacturability of our lives topical again. What do we think is desirable or undesirable? Where are our limits when it comes to intervening in our health? The Rathenau Instituut is investigating these developments. We make visible how interests are constantly changing as a result of new health technology, what the possibilities and consequences are, and where this calls for new frameworks. What do the Dutch think about these issues? What is personal and what is political?

Caring for societal values

Shaping good and healthy living in a changing world

What does society think about intervening in our lives and health? The Rathenau Instituut also dealt with this in 2019. Among other things, we conducted research into the implications and social questions surrounding the creation of embryos for research, health apps, genetic modification of food, and technology in agriculture and animal husbandry.

An important development in healthcare is digitisation, especially the introduction of AI (artificial intelligence). Both to 'coach' ourselves and to support medical decisions. In **Health at the Centre** we gave examples of digital services with which patients and healthy people share data to improve their health. We saw that careful and secure data sharing benefits from small scale and focus on what is really needed for the patient. We formulated tools for government, healthcare, and politics to ensure that the deployment of digital services and the use of data is socially responsible. After all, this often involves very sensitive data.

Frameworks for 'human' digitisation in healthcare

Simple and efficient digital exchange of medical data between healthcare providers and between patient and healthcare provider can lead to better care. But the right frameworks and attention to the necessary changes are still lacking. Sharing medical data is not yet secure. In a Message to Parliament, we therefore drew attention to the debate on data exchange in healthcare and e-health. Social embedding of smart care requires cooperation between all parties involved in healthcare. It is important to first have a political debate on what constitutes good care, and only then on the role of technology in this. The right to meaningful contact and values such as justice and autonomy for people deserve a much better definition. Existing best practices also need to be used more widely and scaled up. There are still too many bad examples.

Together with our sister institutes we presented in October 2019 **Technologies in care for older people**, during a conference at the Swedish Parliament. We also collected good practices and experiences with care innovation, from Japan to the US.

Earlier we formulated 'the right to human contact' as an important addition to existing human rights. In healthcare, this is a key question: in what way does technology help us to live independently? And where does it still stand in the way of responsible care?

Working towards a responsible, sustainable, and healthy living environment

Innovations in the field of food and lifestyle are also changing our environment. In a number of public debates, farmers, scientists, policymakers, and other interested parties discussed these developments.

It's the Food, my Friend, the annual debate series on food and agriculture in the Rode Hoed in Amsterdam, was well attended. In Ede, too, there was a great deal of interest in our debate on knowledge for the transition to circular agriculture.

Biotechnology in plants and animals is a constant subject of political debate. The Rathenau Instituut set out the arguments within this debate for the House of Representatives, in the light of the social significance and policy challenges. We clarified the international legal debate with respect to ethical and societal aspects surrounding the development of the technology, in order to help shape a differentiated policy.

Taking the social context of biotechnological innovations into account was also the focus of the international two-day iGEM meetup, organised by the Rathenau Instituut together with the RIVM. iGEM is a global competition for students working in teams to find solutions to current biotechnological issues. During the meetup in The Hague, participants were able to exchange experiences and information, with special attention to social preconditions and risks.

Nationwide DNA dialogue

The discussion should be wide-ranging

Too few people participate in the discussion about the future of pregnancy and birth and the role of new birth techniques. This is the conclusion drawn from research by the Rathenau Instituut on this theme. The discussion is still mainly conducted among scientists and doctors, and they talk about the technique itself and its safety. While the Dutch think very differently about this subject, and it affects everyone - now and in the future. That is why the social dialogue on this subject must be conducted more broadly.

We wrote that in the report **Discussing the modification of heritable DNA in embryos**. The research shows that by adapting our hereditary DNA, we make decisions about disease and health for the whole of society and for future generations. We need to talk about this very carefully, and together, out of concern for current and future generations. It's not just about DNA, but about the society we want to be.

The Rathenau Instituut therefore took the initiative, together with other organisations, to launch a broad social dialogue on the subject.



The social dialogue on the modification of hereditary DNA in embryos should be broader.

Photo: Co de Kruijf / Hollandse Hoogte

We organised a series of public meetings throughout the country, the first of which took place in October 2019. The results of the dialogue will be summarised in a report at the end of 2020, which will include important arguments existing in Dutch society. This input will assist in informed political decision-making and will be presented to the Minister of Health, Welfare, and Sports.

'With a technology for genetic adaptation early in life, showing solidarity with disabled people may become less and less necessary.'

Gerard Hilhorst, honorary member of the Interest Group for Small People, in response to the national DNA dialogue, of which the Rathenau Instituut is a co-initiator

How can Dutch science continue to be of world stature?



Utrecht University Library.
Photo: Werry Crone / Hollandse Hoogte

Dutch science is among the best in the world. That's great, but how will science and knowledge continue to be of value to our future society? The debate on science policy is about vision, money, personnel, and the ecosystem of knowledge institutions. To this end, the Rathenau Instituut collects facts and figures that provide insight into the state of affairs and can be used for policy questions. We facilitate the dialogue about the future of science. So that all of us - politicians, policymakers, researchers and students - can join in thinking about the knowledge-based society.

Science and innovation with a mission

What does it take?

Decisions for the future

Now that China and the US have formulated their own great ambitions in the field of science and technology, Europe is also looking for a stronger policy of its own. The major societal challenges, such as rising sea levels or sustainable food production, require international cooperation. The Netherlands is striving for world-class science, which is interlinked with society and gives room for the development of talent, the minister stated in the *Wetenschapsvisie 2025. Keuzes voor de toekomst en in Houdbaar voor de toekomst. Strategische agenda hoger onderwijs en onderzoek*, both of which were published in 2019. What does this mean, given the changing geopolitical playing field?

In our research **The Balance of Science 2018** we gave an update on the state of research in the Netherlands. We showed that things are going well, but also that the future resilience and social value of Dutch science deserve attention. To investigate this further, we organised a series of debates in the autumn of 2019, together with the Education Council and the AWTI: **Keuzes voor de toekomst van de wetenschap**. Experts, stakeholders and interested parties shared their experiences. We shared these insights for the formation of political opinions and used them in our follow-up research for science and innovation policy.

From the first debate, on 13 September 2019, we learned that cooperation is easier if the goal is clear and widely supported. 'Dry feet', thanks to dikes and deltas, is an example of a clear mission. Within the water sector, cooperation across borders and disciplines is therefore successful. But not every social challenge is so clear.

Knowledge bridges the gap between research, practice, education, business, and government policy. That was the lesson from the debate on 30 September 2019. As a case study, the transition to circular agriculture was central. It turned out to be not only about the question of how knowledge for circular agriculture ends up on the farm, but also about the opposite question:

How do experience and questions from farms themselves end up with the researchers who are developing knowledge for this social transition? On 28 October 2019, the central question was how education and research can be more intertwined and valued. Melanie Peters: 'We wouldn't be the Rathenau Instituut if we didn't call for a combination of different practices and methods'. A diverse range of research and teaching practices are needed - at universities and colleges of higher education - which may vary from discipline to discipline. We must harness the power of that diversity.

Research and development

The Rathenau Instituut facilitated the debate on science with regular publications of facts and figures. In April 2019 we published the annual overview **Total Investment in Research and Innovation (TWIN) 2017-2023**. Total expenditure on research and development (R&D) in the Netherlands in 2017 amounted to EUR 14.7 billion. Of this, 31% was financed by the government, 52% by companies, 14% by the EU and abroad and 3% by private non-profit organisations. Direct government spending on R&D is increasing, but is lagging behind expected economic growth. As a result, the Netherlands is lagging behind its ambition to spend 2.5% of the gross domestic product (GDP) on R&D.

R&D spending for the Netherlands has been in the range of 1.7% to 2.2% of GDP for more than 50 years, we wrote in November 2019 in **Twee en een half procent**. Major societal challenges, such as climate change or cyber security, have in common that a great deal of knowledge is needed. We concluded that this reinforces the need to invest in innovation in the right way and to focus on cooperation through knowledge policy.

Dutch researchers have been relatively successful in applying for funding from the European framework programme Horizon 2020. Europe's role in funding R&D and innovation will further increase with the successor to Horizon 2020.

Women in science

From choosing a study programme to professorship

Dutch universities employ relatively few female professors; 23.1% of all professors are women. The Rathenau Instituut stimulates the debate about women in science and supports this with facts and figures.

If we look at the proportion of female university staff by job category, we see that the higher the position at the university, the lower the proportion of women. Only Belgium, the Czech Republic, Luxembourg, and Cyprus have a lower proportion of female professors within the EU than the Netherlands.

But from our research **Women in science** it became clear that the proportion of newly appointed female professors has increased in recent years and is in line with expectations based on the proportion of available candidates. We have calculated that it takes an average of 17 years to become a professor from the moment of promotion. We see that the proportion of female PhDs has increased since 1985 from approximately 10% to almost 50% in 2018, with a slight decline since 2015.

If we look at the funding of research applied for by women, it turns out that men and women are equally likely to be awarded a grant. The same research showed that women with a PhD are less likely to apply for a grant than men.



Professors in toga demonstrate because they disagree with the government's austerity plans.

Photo: Bert Beelen / Hollandse Hoogte

There are clear differences between the scientific disciplines, as was shown in **Promoties en masters in Nederland**. Men are in the majority when it comes to education in the fields of technology, nature, and economics. Women are most represented in social sciences, languages, and health care.

'Johanna Westerdijk still has an exemplary role.'

Rathenau researcher and biographer Patricia Faasse about the first female professor of the Netherlands, website Rathenau Instituut, 2 October 2019



Part 3 Publications and figures

In this section you will read about what we published in 2019 and the people and resources the Rathenau Instituut worked with.

A child checks her blood sugar by scanning a FreeStyle Libre Flash glucose sensor with a device on the upper arm.
Photo: Katie Collins / EMPICS

Reports



Kennis voor beleid in beeld (Dutch) \ 11 January 2019 \ 40 pages

Rathenau Instituut (2018). *Kennis voor beleid in beeld – Een methode voor het analyseren van knelpunten en issues en het opstellen van handelingsopties*. The Hague (authors: Deuten, J. & L. van Drooge)

→ Read the report rathenau.nl/nl/kennisgedreven-democratie/kennis-voor-beleid-beeld



In gesprek over ammoniak (Dutch) \ 15 January 2019 \ 66 pages

Rathenau Instituut (2018). *In gesprek over ammoniak – Contouren van een uitweg uit de controverse*. The Hague (authors: Munnichs, G. & H. de Vriend)

→ Read the report rathenau.nl/nl/kennisgedreven-democratie/gesprek-over-ammoniak



Genome editing in plants and crops \ 15 January 2019 \ 50 pages

Rathenau Instituut (2019). *Genome editing in plants and crops – Towards a modern biotechnology policy focused on differences in risks and broader considerations*. The Hague (authors: Habets, M., L. van Hove & R. van Est)

→ Read the report rathenau.nl/en/making-perfect-lives/genome-editing-plants-and-crops



Health at the centre \ 23 January 2019 \ 170 pages

Rathenau Instituut (2019). *Health at the centre – Responsible data sharing in the digital society*. The Hague (authors: Niezen, M.G.H., R. Edelenbosch, L. van Bodegom & P. Verhoef)

→ Read the report rathenau.nl/en/making-perfect-lives/health-centre



Eieren voor het onderzoek (Dutch) \ 5 February 2019 \ 30 pages

Rathenau Instituut (2019). *Eieren voor het onderzoek – Prijs, waarde en impact van wetenschap*. The Hague (authors: Meulen, B. van der, G. Diercks & P. Diederren)

→ Read the report rathenau.nl/nl/vitale-kennisecosystemen/eieren-voor-het-onderzoek



Development of the scientific research profile of the Netherlands | facts & figures | 6 February 2019

→ Read the report rathenau.nl/en/science-figures/output/publications/development-scientific-research-profile-netherlands



Voorbereid op de praktijk (Dutch) | 9 April 2019 | 97 pages

Rathenau Instituut (2019). *Voorbereid op de praktijk – Anticiperen op de maatschappelijke inbedding van innovatie bij onderzoeks- & ontwikkelprogramma's*. The Hague (authors: Sikma, T., P. Verhoef & J. Deuten)

→ Read the report rathenau.nl/nl/vitale-kennisecosystemen/voorbereid-op-de-praktijk



Totale investeringen in Wetenschap en Innovatie (TWIN) 2017-2023 | 15 April 2019 | 36 pages

Rathenau Instituut (2019). *Totale Investeringen in Wetenschap en Innovatie 2017-2023*. The Hague (authors: Vennekens, A., L. Koens & J. de Jonge)

→ Read the report rathenau.nl/nl/vitale-kennisecosystemen/totale-investeringen-wetenschap-en-innovatie-twin-2017-2023



Cyberspace without conflict | 25 April 2019 | 121 pages

Rathenau Instituut (2019). *Cyberspace without conflict – The search for de-escalation of the international information conflict*. The Hague (authors: Hamer, J., R. van Est & L. Royakkers, m.m.v. N. Alberts)

→ Read the report rathenau.nl/en/digital-society/cyberspace-without-conflict



De impact van grootschalige onderzoeksinfrastructuur (Dutch) | 26 April 2019 | 50 pages

Rathenau Instituut (2019). *De impact van grootschalige onderzoeksinfrastructuur – Een meetmethode voor de return on investment van internationale onderzoeksfaciliteiten*. The Hague (authors: Tjong Tjin Tai, S.Y., J. van den Broek & J. Deuten)

→ Read the report rathenau.nl/nl/vitale-kennisecosystemen/de-impact-van-grootschalige-onderzoeksinfrastructuur



Griffiers en digitalisering (Dutch) \ 14 June 2019 \ 75 pages

Rathenau Instituut (2019). *Griffiers en digitalisering – Naar een sterkere lokale democratie*. The Hague (authors: Keulen, I. van, I. Korthagen & P. Diederer)

→ Read the report rathenau.nl/nl/digitale-samenleving/griffiers-en-digitalisering



Bouwen aan krachtige onderzoeksgroepen (Dutch) \ 19 June 2019 \ 66 pages

Rathenau Instituut (2019). *Bouwen aan krachtige onderzoeksgroepen – Eerste ervaringen met het SPRONG-programma van Regieorgaan SIA*. The Hague (authors: Scholten, W., R. Hofman & P. Diederer)

→ Read the report rathenau.nl/nl/vitale-kennisecosystemen/bouwen-aan-krachtige-onderzoeksgroepen



Kennis in het vizier (Dutch) \ 1 July 2019 \ 87 pages

Rathenau Instituut (2019). *Kennis in het vizier – De gevolgen van de digitale wapenwedloop voor de publieke kennisinfrastructuur*. The Hague (authors: Diercks, G., J. Deuten & P. Diederer)

→ Read the report rathenau.nl/nl/vitale-kennisecosystemen/kennis-het-vizier



Data doorzien (Dutch) \ 11 July 2019 \ 69 pages

Rathenau Instituut (2019). *Data doorzien – Ethiek van de digitale transitie in de provincies*. The Hague (authors: Kool, L., R. de Jong & R. van Est)

→ Read the report rathenau.nl/nl/digitale-samenleving/data-doorzien



Wezenlijk anders (Dutch) \ 17 July 2019 \ 47 pages

Rathenau Instituut (2019). *Wezenlijk anders – Lessen voor de maatschappelijke dialoog over het combineren van menselijk en dierlijk celmateriaal*. The Hague (authors: Baalen, S. van, J. Gouman & P. Verhoef)

→ Read the report rathenau.nl/nl/maakbare-levens/wezenlijk-anders



In de geest van open science (Dutch) | 19 July 2019 | 60 pages

Rathenau Instituut (2019). *In de geest van open science – Publieke betrokkenheid bij onderzoek in de psychiatrie*. The Hague (authors: Ewijk, S. van, W. Scholten & P. Diederren)

→ Read the report rathenau.nl/nl/vitale-kennisecosystemen/de-geest-van-open-science



Klimaatgericht onderzoek en innovatie (Dutch) | facts & figures | 16 August 2019 | 12 pages

→ Read the report rathenau.nl/nl/wetenschap-cijfers/impact/klimaatgericht-onderzoek-en-innovatie



Citizens and sensors | 11 September 2019 | 112 pages

Rathenau Instituut (2019). *Citizens and sensors – Eight rules for using sensors to promote security and quality of life*. The Hague (authors: Snijders, D., M. Biesiot, G. Munnichs & R. van Est, with S. van Ool and R. Akse)

→ Read the report rathenau.nl/en/digital-society/citizens-and-sensors



Discussing the modification of heritable DNA in embryos | 2 October 2019 | 166 pages

Rathenau Instituut (2019). *Discussing the modification of heritable DNA in embryos – Lessons for a public dialogue*. The Hague (authors: Baalen, S. van, J. Gouman & P. Verhoef)

→ Read the report rathenau.nl/en/making-perfect-lives/discussing-modification-heritable-dna-embryos



Responsible VR | 19 November 2019 | 75 pages

Rathenau Instituut (2019). *Responsible VR – Protect consumers in virtual reality*. The Hague (authors: Snijders, D., S. Horsman, L. Kool & R. van Est)

→ Read the report rathenau.nl/en/digital-society/responsible-vr

Other publications

Work programme 2019/2020

7 January

Inzet van sensordata voor leefbaarheid en veiligheid / Using sensor data for safety and quality of life

16 January, article

Experts: kennis over circulaire economie lekt weg

16 January, article

Uitdagingen voor regulering van drones en killer robots

17 January, schriftelijk inbreng Tweede Kamer

Excellence is extra-ordinary: thirty years of focus on excellence in Dutch science policy

17 January, translation

Gezondheid centraal: zorgvuldig data delen in de digitale samenleving

24 January, Message to Parliament

Hoe kijken mensen naar het gebruik van sensordata voor leefbaarheid en veiligheid?

30 January, article

Kruip met Crispr-Cas-voedsel niet weer de loopgraven in

7 February, article

Inkomsten en prestaties Nederlandse universiteiten; onderwijs

11 February, article

Onderzoek aan universiteiten en umc's

11 February, article

From technological dreams to societal action

11 February, translation

Valuable digitalisation: how local government can play the technology game in the public's interest

13 February, translation

Desinformatie in Nederland

14 February, Message to Parliament

Bodemdaling: een steeds acuter probleem

15 February, article

Van technisch dromen naar maatschappelijk doen

15 February, article

What do citizens think about the use of sensor data for safety and quality of life?

18 February, translation

Digital engagement

18 February, translation

Niet AI, maar zorg moet centraal staan in de zorg

20 February, article

Digitaal burgers betrekken

22 February, article

Innoveren voor maatschappelijke doelen

1 March, article

Innovating for societal aims

1 March, translation

Hoe houdt de Raad van Europa het mensenrechtenverdrag actueel?

4 March, article

Nieuwe serie: hoe komen ministeries aan kennis?

5 March, article

Digitaliseren vanuit publieke waarden

6 March, article

Digitalisation informed by public values

6 March, translation

Nieuw initiatief voor gesprek over aanpassen DNA in embryo's

7 March, article

Aandeel nieuwe vrouwelijke hoogleraren stijgt sneller dan verwacht

8 March, article

Zo staat AI op de agenda van de EU

11 March, article

Artist in residence: 'Ruimte om te provoceren'

12 March, article

Mensenrechten in de digitale tijd: dit bespreekt de VN

13 March, article

Online portalen in de GGZ: toegang tot data

14 March, article

Je eigen huid printen en andere toekomstmuziek

15 March, article

Open access van wetenschappelijke publicaties

16 March, article

Open access to research publications

16 March, translation

Health apps: data in gebruik

18 March, article

Zo brengen we AI in de praktijk vanuit Europese waarde

19 March, article

Jaarverslag 2018

20 March

Persoonlijke gezondheidsomgevingen: data in beheer

21 March, article

De waarde van denktanks / Melanie Peters

1 April, article

Hoe we onze tanden kunnen zetten in het wereldvoedselvraagstuk

5 April, article

Missiegericht beleid in uitvoering

5 April, Message to Parliament

Annual report 2018

9 April, translation

Elke patiënt heeft zijn eigen verhaal - en zijn eigen data / Every patient has their own story - and their own data

10 April, article

Plantgezondheid: maatschappelijke inbedding van innovatie

11 April, Message to Parliament

Development of the scientific research profile of the Netherlands

11 April, translation

Het debat over de betekenis van AI begint pas net

17 April, article

Wat kost kennis voor beleid?

25 April, article

Acties voor cybervrede

25 April, Message to Parliament

Tijd voor een 'reality check': nieuw onderzoek naar virtual en augmented reality

29 April, article

Cyberaanvallen: dit gebeurt er bij sabotage**Cyberaanvallen: dit gebeurt er bij spionage****Cyberaanvallen: dit gebeurt er bij de verspreiding van desinformatie**

30 April, articles

We moeten gaan praten over cybervrede

3 May, article

Wetenschapsbeleid voor de samenleving: het publieke belang van kennis

3 May, Message to Parliament

Tekort aan democratische controle over digitalisering

13 May, Message to Parliament

Hybride aardappel biedt kansen voor Nederland

16 May, article

Hoe weet je of health apps betrouwbaar zijn?

27 May, article

Wat zijn goede wetenschappers?

27 May, article

Deze boevenspotter zet zakkenrollers op YouTube: 'Ik wil mensen bewust maken'

3 June, article

Winnaar 'Wetenschapstalent 2019' bekend

3 June, article

Innovatiebeleid is aan innovatie toe

4 June, article

Hoe blockchain in de Rotterdamse haven maatschappelijk verantwoorde ketens mogelijk kan maken

5 June, article

Hoe blockchaintechnologie onze levens kan veranderen**Bitcoin en andere valuta: de voorhoede van blockchaintechnologie****Zo kan blockchain helpen tegen piraterij Zo kan blockchain het octrooisysteem verbeteren Zo kan blockchain logistiek en productieketens verbeteren**

5 June, articles

Hoe houdt privacy zich tot het verzamelen van data door gemeenten?

6 June, article

Health at the centre: responsible data sharing in the digital society

6 June, translation

Hoe speelt kennis een rol in beleid? (serie: 'Hoe komen ministeries aan hun kennis?')

7 June, article

In Eindhoven herkent een algoritme vechtpartijen

11 June, article

Dankzij deze rondreizende sensoren kunnen rondreizende bandieten minder hun gang gaan

13 June, article

Genome editing in plants and crops: towards a modern biotechnology policy focused on differences in risks and broader considerations

13 June, translation

Naar een sterkere lokale democratie: zo kan digitalisering de griffier en gemeenteraad helpen

13 June, article

De rij voorbij

17 June, article

Deze agent heeft een extra paar ogen: de bodycam

17 June, article

Praktijkgericht onderzoek hogescholen professionaliseert

19 June, article

iGEM students meet in the Hague: societal value of biotechnology on the agenda

20 June, article

Plantgezondheid: maatschappelijke inbedding van innovatie

20 June, article

Erfelijk dna veranderen: dialoog over de grenzen

24 June, article

Een veiligere stad met slimme sensoren?

24 June, article

Digitale wapenwedloop vereist nieuwe onderzoekskaders

30 June, article

In gesprek over voorzorg, veiligheid en verantwoordelijkheid bij nieuwe technologie / New technology: a conversation about precaution, safety and responsibility

1 July, article

Keuzes voor de toekomst van de wetenschap: debatreeks

4 July, article

Tweede Kamer maakt werk van digitalisering

7 July, article

Verantwoord digitaliseren in de samenleving

11 July, article

Definitieve veilige opslag van radioactief afval vereist maatschappelijke betrokkenheid

11 July, article

Hoe zorgen ministeries ervoor dat ze de goede kennisvragen (kunnen) stellen?

(serie: 'Hoe komen ministeries aan hun kennis?')

12 July, article

Celmateriaal van mensen en dieren samenvoegen: bespreek het zorgvuldig

17 July, article

Hey Google, wat weet jij van mij? / Hey Google, what do you know about me?

18 July, article

In open science nog te weinig aandacht voor publieke betrokkenheid

19 July, article

Wie zit er aan de knoppen? Hoe 'coders' jouw leven bepalen / Who's at the wheel? How coders control your life

22 July, article

Data voor de natuur

22 July, article

Bedrijven zijn de grootste uitvoerders van klimaatgerichte onderzoek en innovatie in Nederland

23 August, article

Cyberspace without conflict: the search for de-escalation of the international information conflict

27 August, translation

Universiteiten, focus meer op het algemeen belang

2 September, article

Technologie in de veehouderij: let op een nieuw speelveld

4 September, Message to Parliament

Data voor mobiliteitsvraagstukken

4 September, article

Hoe organiseren ministeries het (laten doen van) onderzoek?

(serie: 'Hoe komen ministeries aan hun kennis?')

4 September, article

Artist in residence: rugzakken in de trein fotograferen

6 September, article

Nederlanders stellen voorwaarden aan gebruik sensoren door politie

11 September, article

De rol van wetenschap bij maatschappelijke uitdagingen

13 September, article

Wat er kan gebeuren als de samenleving de preventie van ziektes vóór alles plaatst

27 September, article

Maatregelen voor cybervrede: betere regulering van technologisch nieuwe

27 September, Message to Parliament

Evenveel kans voor mannen en vrouwen op toekenning onderzoeksbeurs

2 October, article

Rinie van Est is hoogleraar Technology Assessment and Governance

2 October, article

Johanna Westerdijk heeft nog steeds een voorbeeldrol

2 October, article

Gegevensuitwisseling in de zorg: aandachtspunten voor maatschappelijk verantwoord datagebruik voor gezondheid

3 October, Message to Parliament

Maatschappelijke transitie is alleen mogelijk met circulaire kennis en samenwerking

10 October, article

Hoe spelen evaluaties een rol in kennis voor beleid?

(serie: 'Hoe komen ministeries aan hun kennis?')

23 October, article

Omgang met energiedata vraagt om een nationaal plan

25 October, article

Financiering publieke kennisorganisaties

25 October, article

Public knowledge organisations

25 October, translation

Forensisch onderzoek

28 October, Message to Parliament

Een missiegerichte aanpak voor slimme zorg en e-health

6 November, Message to Parliament

Verstandig internationaliseren: Nederlands toegepast (water)onderzoek in het buitenland

8 November, article

Bescherm consument in virtual reality

19 November, article

Digitalisering in het hoger onderwijs vraagt aandacht

19 November, Message to Parliament

Debat: synergie tussen onderzoek en onderwijs

20 November, article

Grip op data cruciaal voor energietransitie

25 November, Message to Parliament

Hoe maken we ons hoger onderwijs toekomstbestendig?

27 November, article

Hoe werken we samen aan verantwoorde digitalisering?

29 November, article

Meningsvorming over embryo-onderzoek en toepassing ervan in de praktijk

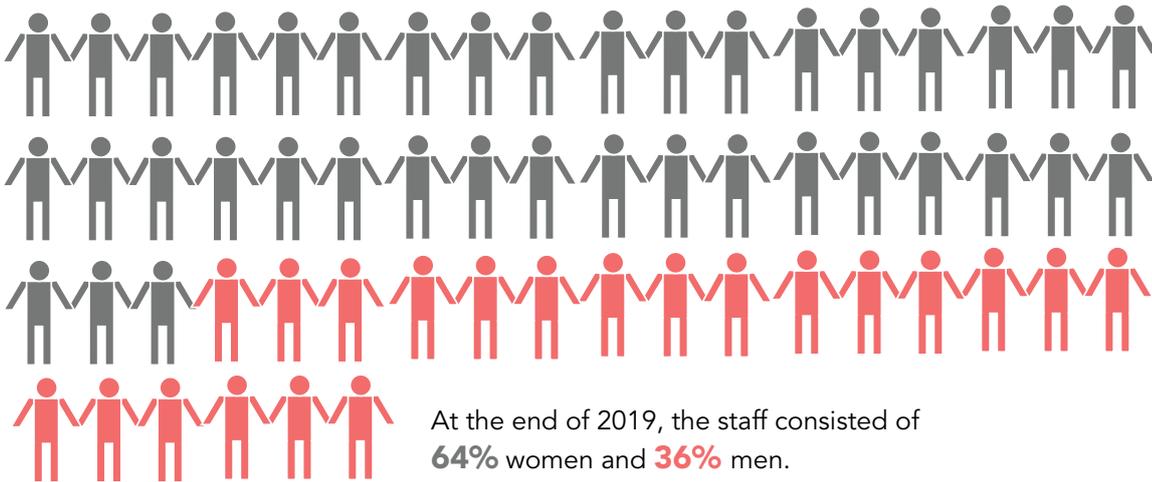
29 November, Message to Parliament

Wat als gelijkheid binnen de samenleving ons belangrijkste doel zou zijn?

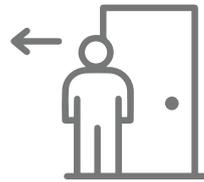
9 December, article

Annual personnel report

On 31 December 2019, **60** people (50,89 fte) were employed. At the end of 2018 there were 55 (47,58 fte).



15 employees departed in 2019.



19 employees joined the company in 2019.



The percentage of permanent employees increased from 44% to **47%**.

In 2019 we welcomed **5** trainees.



The percentage of employees under 40 years of age was **55%** in 2019.

The absence rate was **3,15%**. In 2018, this was 2,28%.

Annual financial report

Income 2019

In 2019, the Rathenau Instituut realised income of EUR 5,270k, EUR 86k higher than budgeted. The Ministry of Education, Culture and Science received EUR 4,519k as a lump sum through the KNAW. This is 86% of the total income (last year 84%). The acquisition of external financing went well and some projects generate income for several years. As a result, the structural character of

sufficient external funding is perpetuated. The income from externally financed contracts resulted from a total of 28 projects. The money came from European H2020, STOA and national projects for ministries of EZK, OCW and IenW. In addition, a number of small assignments were carried out. Income from external contract projects accounted for 16% of the lump sum.

Income (x € 1.000)	Realisation	Budget	Difference
Contribution ministry of OCW	4,519	4,519	0
External financing	703	650	53
Other income	48	15	33
Total income	5,270	5,184	86

Year (x € 1.000)	2015	2016	2017	2018	2019
Total income	4,911	4,864	4,807	5,166	5,270
Total income Ministry of OCW	4,135	4,157	4,241	4,346	4,519
External financing	687	660	525	783	703
External financing relative to contribution ministry of OCW	17%	16%	12%	18%	16%

Expenses 2019

Total expenses amounted to EUR 5,208k. This is EUR 112k less than foreseen when the budget was drawn up. Personnel costs were EUR 216k lower.

There were also fewer material costs. The project costs were k€ 105 higher.

Expenses (x € 1.000)	Realisation	Budget	Difference
Personnel costs	3,944	4,160	-216
Project costs	595	460	105
Material costs	699	700	-1
Total expenses	5,208	5,320	-112

PLEASE NOTE The annual accounts of the Rathenau Instituut are consolidated in the annual accounts of the KNAW and are included as such as part of the annual report of the KNAW.

Board

Gerdi Verbeet (Chair) \ Chair of the National Committee 4 and 5 May and supervisor at a.o. Novamedia.

Prof. dr. Noelle Aarts \ (per 1 March 2019) / Professor of Socio-Ecological Interactions, Director of the Centre for Dialogue.

Prof. mr. dr. Madeleine de Cock Buning \ (until 1 December 2019) / Professor of Author and Media Law at Utrecht University and Professor of Digital Politics Economy & Societies at the European University Institute School of Transnational Governance in Florence, Italy, Chair of the Dutch Media Authority (until June 2019).

Prof. dr. Roshan Cools \ Professor of Cognitive Neuropsychiatry at the Radboud University Medical Centre, board member AWTI and member of the KNAW.

Dr. Hans Dröge \ Supervisor at, among others, the Brabantse Ontwikkelings Maatschappij and the Algemene Werkgevers Vereniging Nederland.

Edwin van Huis (until 1 December 2019) | General Director Naturalis Biodiversity Center, Leiden, the Netherlands.

Prof. mr. dr. Erwin Muller \ Dean of the Faculty of Governance and Global Affairs (FGGA) at Leiden University in The Hague, Professor of Security and Law at the same faculty, Director of Campus The Hague at Leiden University.

Prof. dr. Marijk van der Wende \ Faculty Professor of Law, Economics, Governance and Organisation at Utrecht University, visiting professor at Shanghai Jiao Tong University, China, member of the Academia Europaea (behavioural sciences section).

Prof. dr. ir. Peter-Paul Verbeek \ University professor of Philosophy of Man and Technology and scientific co-director of the DesignLab at the University of Twente, honorary professor of Techno-Anthropology at the University of Aalborg, Denmark, and a.o. member of the KNAW and the Supervisory Board of TNO.

Dr. ir. Melanie Peters (secretaris) \ Director Rathenau Instituut, The Hague.

For an up-to-date overview of the positions and ancillary functions of the members of the board, please visit rathenau.nl/en/about-us/who-we-are/our-board

Programme Panel

Gerdi Verbeet (Chair) Chair of the National Committee 4 and 5 May and supervisor at a.o. Novamedia.

Ir. Annet Aris MBA teaches digital strategy at INSEAD Business School in France and is a commissioner at various companies.

Marien Baerveldt builds innovative learning communities at Utrecht University and is team and process facilitator at Hosted Beings.

Dr. Rob Bijl is Deputy Director of the Social and Cultural Planning Bureau (SCP).

Marc Chavannes (until November 2019) is a journalist at De Correspondent, former editor and foreign correspondent at NRC Handelsblad and emeritus professor of journalism at the University of Groningen.

Felix Cohen is, among other things, Chair of the Supervisory Board of Regina Coeli and former director of the Consumers' Association.

Dr. Linda Duits is a researcher, publicist and lecturer in Media Studies and Gender Studies, affiliated with Utrecht University.

Drs. Bas Eickhout is a Member of the European Parliament.

Bert Fokkema works for Shell in an international team that develops policies and internal standards for the decommissioning of oil and gas production facilities.

Yuri van Geest is founder of ExOxo (corporate transformation) and co-author of the bestselling Exponential Organisations.

Peter Giesen is a reporter and commentator for de Volkskrant.

Joana Gomes Neto is a student-member and follows the master Molecular Biology & Biotechnology at the University of Groningen.

Prof. dr. Rob J. Hamer is Vice President Agrifood External Affairs Unilever NL N.V. and Extraordinary Professor of Food Chemistry at Wageningen University & Research.

Rob van Hattum is Editor-in-Chief of Science for the VPRO and Chief Technology Officer at NEMO.

Dr. Janneke Hoekstra has had her own independent consultancy firm Hoekstra Management en Advies since the end of 2019. She is also Chair of the Supervisory Board of Rijnstad, a welfare organisation for Arnhem and the surrounding area.

Yori Kamphuis is co-founder of Coblue and Storro.

Dr. Annette Klinkert is founder of the company city2science.

Mr. Laurien Koster is, among other things, an independent Chair of the Children's Rights Collective and a member of Oxfam Novib's Supervisory Board.

Drs. Chris Kuijpers is Director-General of Administration and Housing at the Ministry of the Interior and Kingdom Relations.

Willem Lageweg is director/quartermaster of the Transition Coalition Coalition Food and holds administrative and supervisory positions at Triodos Bank, Max Havelaar, Louis Bolk, and Institute Positive Health.

Dr. phil. René von Schomberg is a philosopher and specialist in science and technology studies, working at the European Commission and visiting professor at Darmstadt University of Technology.

Jeanine van de Wiel is DSM's Global Regulatory Affairs Manager in the field of food ingredients and health.

David Winickoff is a senior policy analyst at the Organisation for Economic Co-operation and Development (OECD) and professor of law at the Sciences Po Law School.

Lynn Zebeda is co-founder of research & ideation agency Dr. Monk.

Dr. ir. Melanie Peters (secretaris) is director of the Rathenau Instituut in The Hague.

The Rathenau Instituut stimulates public and political opinion formation on the social aspects of science and technology. We conduct research and organise the debate on science, innovation, and new technologies.

www.rathenau.nl

Rathenau Instituut