

Annual Report 2016



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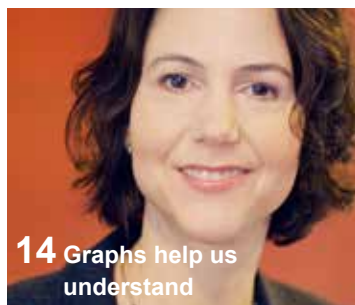
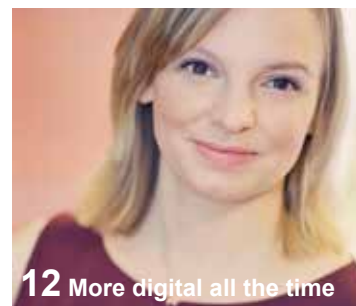
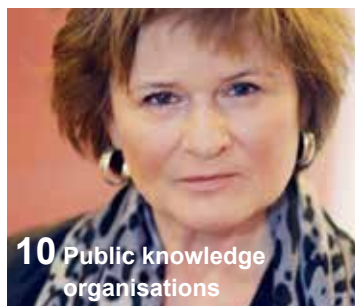
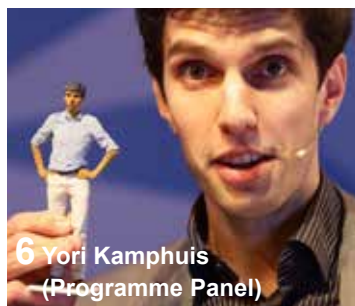
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Timeliness, quality and independence



Experienced authors often advise young writers to “show, don’t tell”. What they mean is that they should write scenes in a way that allows readers to form their own impression. According to this theory, a writer shouldn’t just report on events. For example, it’s better to say “He swallowed hard and rubbed his eyes” than “He cried”.

I think that I’m going to break the “show, don’t tell” rule here, however. The Rathenau Instituut’s 2016 annual report already shows enough of what the institute has accomplished in the past year, allowing you to form your own impression. This is the place for more “telling”.

Someone recently asked me what I liked about the Rathenau Instituut. As we talked, I identified three features: timeliness, quality and independence.

Let’s start with timeliness. The Rathenau Instituut is always quick off the mark. It spots trends early on, long before most people and organisations start losing sleep over it. Take the whole debate about cloning. The institute was already examining this subject fifteen years ago. Nowadays, new technologies have brought clones a step closer. The Rathenau Instituut is ready to jump in with its expertise and experience.

The second feature is quality. I’ve always been impressed by the quality that the institute delivers. Its researchers are persistent and investigate until they get to the very bottom of trends in science and technology. For example, Dutch scientists – especially medical researchers – complained about feeling under too much pressure, but initially the figures contradicted them. The Rathenau Instituut examined the matter and revealed that faculty deans are like circus jugglers, keeping several plates spinning at once.

The third feature is independence. The Rathenau Instituut makes complex subjects accessible to politicians and the public. It doesn’t choose sides and identifies the options available. The institute acknowledges all the many interests and values involved in a matter. That means it connects science and society. I consider this a blessing in a society in transition.

There, I’ve had my say. Now it’s up to you to read this annual report and form your own impression of the Rathenau Instituut.

Gerdi A. Verbeet, *Chair of the Board of the Rathenau Instituut*

“We fuel the debate as an expert body”

“I’ve noticed a sense of resignation among policymakers, politicians and the public about all the rapid advances in technology. We feel a little overwhelmed and think we just have to accept the caprices and depend on the good will of technological progress. But *we are* society. It’s up to us, as a society, to decide how we want to treat one another,” says Melanie Peters, director of the Rathenau Instituut.

What do you think were the highlights of 2016 for the Rathenau Instituut?

“Ha, how much time do you have? The first thing that crosses my mind is the launch of www.rathenau.nl/en/science-in-figures.

This website explores the Dutch knowledge eco-system in a series of tables, figures and graphs.

In 2016, we produced and updated about a hundred factsheets and data publications. The site is popular with journalists, MPs and other parties.”

And the second highlight?

“That was our thirtieth jubilee celebration. We published a long read about Gerhart Rathenau – the man who got the Netherlands to use the personal computer. In the late 1970s, early 1980s he was one of the people here who thought that a package of measures was needed to prepare the Netherlands for the digital future. It’s partly thanks to Gerhart Rathenau and his committee that we saw working time reduction schemes, retraining programmes, and projects helping employees to save up for a personal computer. Today, in 2017, we’re about to enter a new era of digitisation and robotisation.

The Rathenau Instituut published reports on this topic in 2015 and 2016 and we will continue to examine it in 2017. And at the advice of the same Gerhart Rathenau, an institute was established tasked with investigating the influence of science and technology on society. At first it

was called NOTA, but later – you guessed it – it became the Rathenau Instituut.”

Any other highlights in 2016?

“Yes, although it was more of an internal event. We divided two research departments into six teams and started working on a project basis. It takes some getting used to, but it makes our institute more agile. Project-based working lets us share our knowledge and experience with one another, ensuring that it is retained, even if staff leave.”

The institute completed its 2015-2016 work programme in 2016. What will happen next?

“We published our new work programme for 2017-2018 in late 2016. The document is itself a fine example of our approach at the Rathenau Instituut. In the first part we outline the values that underpin how we will work on our mission. We identify three priority areas in which we intend to fuel the debate as an expert body. The second part of the document describes new studies that we have planned for the coming two years.”

What are the three priority areas?

“The first is trust in digitalisation. The second is expert and citizen input in policymaking and political decision-making. And the third is the transition to a futureproof knowledge eco-system.” ▶

And what studies have you planned?

"I suggest that you read through the work programme for that! Of course, the studies will fall under the three priorities, digitalisation, knowledge for policy, and knowledge eco-systems. For the rest, our research will continue to build on our existing and valued expertise. And we'll obviously explore new territory. I should mention that we drafted our work programme in consultation with our Programme Panel and other stakeholders."

It's a cliché question, but what do you like about your work and about the institute?

"The best thing about the institute is our expertise. We understand science and technology and we know how to organise the relevant debate. Beyond that, it is greatly satisfying to feel that we can help politicians, policymakers and other stakeholders make choices. We see that, for example, in such areas as health, robotisation, the sharing economy, genetic engineering and science policy."

What do you feel is missing or what would you like to see more of in our society?

"Two things. The first is a debate about facts and feelings. I think the discussion should be much less black-and-white than it is now. It's not an either/or issue – *either* facts or feelings. It's 'and/and'. Facts and knowledge are very important to me. Let me make that clear from the outset. And fortunately, the Netherlands has a rock-solid knowledge system in which research



"It is greatly satisfying to feel that we can help politicians, policymakers and other stakeholders make choices."

universities, research institutes, public knowledge organisations, businesses and universities of applied sciences work together to deliver the knowledge that we need. But emotions and interests also matter. So I think scientists who participate in the public debate should not only focus on facts but also make allowance for interests and emotions."

And the second matter that you find concerning?

"We live in an age in which we are witnessing a rapid succession of new technologies and trends. Facebook, Uber, Airbnb – the list is almost endless. I've noticed a sense of resignation among policymakers, politicians and the public. We feel a little overwhelmed and think we just have to accept the caprices and depend on the good will of technological progress. I don't agree with that. We are society. It's up to us, as a society, to decide how we want to treat one another. We can decide for ourselves how we will use science and technology to shape society." ■

“You rise above the political debate”

“The political debate is growing fiercer and seems to be getting more personal. The Rathenau Instituut is able to rise above all that. That’s the right thing to do.” Speaking is Yori Kamphuis of Coblue Cybersecurity. Yori is a member of the Rathenau Instituut Programme Panel.



Yori Kamphuis

What is it about the Rathenau Instituut that appeals to you?

“The Rathenau Instituut considers the impact of science, especially technology and innovation, on society and how it is designed. You do good work in this area.”

Why is that relevant?

“Technology is advancing more rapidly all the time. And that means that it is having a growing impact on society. Instead of looking only at the technology push, the Rathenau Instituut helps to evaluate the impact of changes and whether that impact is favourable or unfavourable.” ▶

Yori Kamphuis

Yori Kamphuis is one of the 25 members of the Programme Panel. Kamphuis is co-founder of Coblue Cybersecurity. He is also the Global Shaper of the Amsterdam Hub, part of the World Economic Forum’s international network of Global Shapers, young adults who are working to build a better world. Kamphuis further advises StartupDelta, the Dutch programme for start-ups.

What did the Programme Panel do in the past year?

“We had several interesting discussions, for example about de-urbanisation as a reaction against the generally accepted urbanisation trend. I was also able to share my knowledge and experience of cybersecurity, privacy and the impact of fast-growing technologies.”

Does the institute listen to what the Programme Panel says?

“Yes it does. Just look at topics like biotechnology and synthetic biology, the privacy of the digital patient, and the setup of the new work programme for 2017-2018. These are all topics that we discussed in the panel and that the Rathenau Instituut is addressing or will address.”

Anything you'd like to add?

“I'm glad that the Rathenau Instituut is able to rise above the political debate. That debate is growing fiercer and seems to be getting more personal. The Rathenau Instituut rises above all that. I hope that it gets the recognition it deserves for this in 2017.” ■

Programme Panel

The members of the Rathenau Instituut's Programme Panel represent different sectors of society. The panel meets several times a year, discusses new trends and developments, and advises the Rathenau Instituut on its work programme. Gerdi A. Verbeet, chair of the Rathenau Instituut Board, also chairs the Programme Panel.



Reducing life to big data

The average music festival-goer has grown up with smartphones, apps and social media. But time does not stand still. More and more data is being linked. It makes life easier for the man on the street. But who has access to all that data? Who is profiting from it? The Rathenau Instituut draws attention to the implications of this technological revolution. ▶



In 2016, researcher Jelte Timmer worked on the project Big data and smart algorithms. On 20 August, he shared his own stories about apps at the Lowlands Festival: "Our obsession with tracking means we overlook the essence."

"My best friend loves sport cycling. Before, when I'd ask him 'How was your ride', he'd usually say things like 'Hard, difficult route. Headwind, legs felt like lead.' Or he'd say, 'It was good, smooth cadence, ate a lot of pasta.' But when I ask him now how his ride was, his growls something like, '28.6' or '30.3 average'. That's because my pal recently got Strava, an app that tracks how fast, how far and where he's cycled. And that app has changed his experience of cycling into a statistical focus on scores and numbers. My friend is not alone. Millions of people in the Netherlands use these kinds of apps to quantify their behaviour. Some use apps like Strava or RunKeeper, or a calorie tracker to track how much they're eating. The act of logging and tracking activity does something to us. During my study of tracking and being tracked, I asked myself precisely what that something is. And why we love numbers so much. When does tracking tip over into the extreme?"

Sex tracker

"We track more and more of the world around us. There are smart baby clothes that track your baby's body temperature in real time. There are apps that track your sexual stamina. One brand-new app is the friendship app. It consists of a wristband that measures your stress levels when you're socialising with friends. The app tells you which of your friends cause you stress and which ones make you feel happy. What's ingenious about the app is that it will automatically unfriend the people who cause your stress levels to skyrocket. The app developer is not some big investor but an artist in the USA named Lauren McCarthy. Lauren wants her project to show that perhaps we shouldn't be tracking everything. She wants to demonstrate that quantification can reduce something as complex as friendship to a 'maximum happiness score' even though friendship is really about sharing happiness and unhappiness."

Pappardelle

"We do the same thing with food. Eating is a social affair, it creates memories. It's pleasurable, it evokes emotions. It's something we enjoy. But what do we do? We count calories. We reduce handmade pappardelle noodles to 660 calories. Okay, I get that we're simplifying things and making them quantifiable. But by doing that, we're at risk of overlooking the essence of what life is all about. We look at our apps when we should be looking at each



Jelte Timmer: "In an age in which there's an app for everything, the challenge will be to not quantify every experience."

other. Why use smart baby clothes to monitor the breathing or body temperature of a healthy baby? Wouldn't it be better to bend down and check the baby yourself? Why would a Wall Street stock market analyst want to analyse his sexual stamina? Will that make him happier? Will it make him a better person? In an age in which there's an app for everything, the challenge will be to not quantify every experience. To not need to know everything. And to not need an app to tell us whether something is right or wrong."

More information

Watch the video on Vimeo:

<https://vimeo.com/180157034> ■

“Public knowledge organisations are socially and politically relevant”

One of the Rathenau Instituut’s tasks is to initiate research into the Dutch knowledge infrastructure. One example is its publication *Facts and Figures of Public Knowledge Organisations*. We spoke to the project manager, Patricia Faasse.

Public knowledge organisations, part 1

“We came up with the term *public knowledge organisations* at the Rathenau Instituut. These are organisations that are not universities but that do conduct research on behalf of society. Examples are the National Institute for Public Health and the Environment (RIVM), Deltares, the Netherlands Organisation for Applied Scientific Research (TNO), the Royal Netherlands Meteorological Institute (KNMI) and the Netherlands Forensic Institute. They are organisations that conduct research in support of policymaking and also work for public authorities or for commercial parties. Their research focuses on protection against disease, flood prevention and solving crimes.”

The knowledge eco-system

“The Rathenau Instituut studies the Netherlands’ knowledge eco-system. The first organisations that come to mind are universities and the research institutes of the Royal Netherlands Academy of Arts and Sciences (KNAW) or the Netherlands Organisation for Scientific

Research (NWO). The public knowledge organisations remain hidden from view. But now we’ve shed light on them as a group of organisations that generate knowledge of relevance to society and to policymaking. That means we’ve mapped out a vital part of the knowledge eco-system. And we’ve developed a framework for describing and understanding the role and position of these organisations.”

The family

“Public knowledge organisations are all canines, as it were, but within that group you have Dachshunds and Bouviers des Flandres. All different, but the same species. While they differ in size, each one is linked to a policy domain and reports to a particular ministry.”

Public knowledge organisations, part 2

“We started out calling them non-academic knowledge institutions (NAKs), but they didn’t like that. ‘We’re nixing NAKs!,’ they told us, and they were right. It’s a negative definition, stating what they are not. So after some ▶

consultation, we came up with 'public knowledge organisation'. We included a total of 29 in our study."

Pressure

"The report showed that there's pressure on funding for public knowledge organisations. This is worrisome. After all, these are organisations entrusted with public tasks, for example our physical safety. And that requires expertise. We intend to continue studying, analysing and debating the public knowledge organisations in 2017-2018. Our focus will be on internationalisation and the decentralisation of policy to local authorities. These trends are also changing the demand for knowledge."

Public knowledge organisations, part 3

"We have invited all the organisations to discuss our conclusions with us. They are happy to have their role in the Dutch knowledge eco-system recognised. The public knowledge organisations perform a complex balancing act between science, government, enterprise and society. These actors sometimes have conflicting expectations of them. It's difficult to strike the right balance. They identified with and drew strength from the fact that other public knowledge organisations were also struggling with these issues, as diverse as they might be. The relevant ministries also valued our report for giving them a fresh perspective on things." ■



Patricia Faasse: "There's pressure on funding for public knowledge organisations."

Other research by the Rathenau Instituut on the knowledge eco-system

Spinning plates

In *Spinning plates – Funding streams and prioritisation in Dutch university research*, the Rathenau Instituut combined official figures with a survey of university deans. It became clear that much of a university's budget consists of competitive project funding. The researchers could not help but think of a circus act in which a juggler tries to keep as many plates spinning at once.

Publication: Elizabeth Koier, Barend van der Meulen, Edwin Horlings and Rosalie Belder, *Spinning plates – Funding streams and prioritisation in Dutch university research*. The Hague: Rathenau Instituut, 2016. See also: www.rathenau.nl/en/publication/spinning-plates-funding-streams-and-prioritisation-dutch-university-research

Practice-based research at universities of applied sciences (Praktijkgericht onderzoek bij hogescholen - Publication in Dutch only)

In its publication *Praktijkgericht onderzoek bij lectoraten van Hogescholen*, the Rathenau Instituut charts the development of practice-based research at universities of applied sciences for the very first time. It concludes that universities of applied sciences are undertaking more research and that a network is emerging between different target groups. The senior lecturers (i.e. professors) in higher professional education function as knowledge brokers.

Publication: De Jonge, J., *Praktijkgericht onderzoek bij lectoraten van Hogescholen. Feiten & Cijfers* 19. Den Haag: Rathenau Instituut. See also: www.rathenau.nl/nl/publicatie/praktijkgericht-onderzoek-bij-lectoratenvan-hogescholen

More digital all the time

There are numerous examples of everyday digitalisation in and around Linda Kool's office. We don't often stop and think about the growing influence of digitalisation on our thinking, our choices and our actions. But the Rathenau Instituut has considered that very topic in numerous publications, including *Human rights in the robot age: challenges arising from the use of robotics, artificial intelligence, and virtual and augmented reality*. Digitalisation has lost its innocence.

Face

Face recognition technology has improved vastly. Computers have recently become better than humans at recognising false emotions. Will it soon be impossible to tell a white lie? And what will happen to our anonymity in public areas?

iPhone

It's difficult to hack an iPhone. The FBI found that out in 2015 when it wanted to gain access to the data stored in an iPhone after a shooting. Apple refused to assist, stating: "This would undermine the very freedoms and liberty our government is meant to protect". In this situation, Apple played a striking role as an advocate for privacy.

Google search results

I use Google all the time. That allows Google to learn what my interests are. My search results are personalised. This is now known as a “filter bubble”. Google simply does not show us some information. The risk is that we develop a skewed view of the world that way. It’s hard to make informed choices when we don’t have all the information. It impacts on our autonomy and our freedom of expression.

Robot

Robots are becoming increasingly capable of taking over more and more human tasks like taking care of the elderly. The danger is that care will be dehumanised. We will have to choose which tasks we do and do not want to entrust to robots.

Samsung user’s manual

This is the privacy manual for a Samsung smart TV. Samsung tracks your viewing behaviour in detail. But your television can also recognise your face and record conversations. The manual warns you to be careful what you say around the TV: “That information will be among the data captured and transmitted to a third party”. Can we really expect users to study the terms and conditions of use for every single device they acquire? Or is it up to manufacturers to make their warnings clearer?

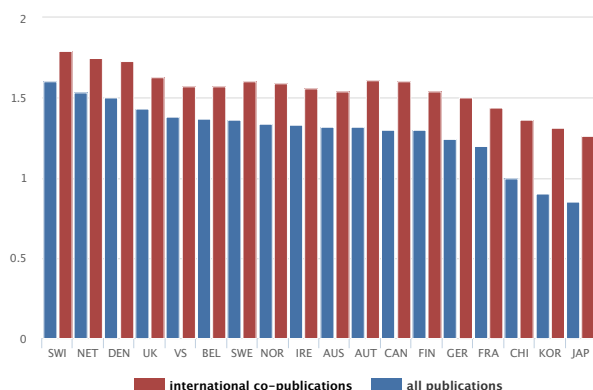
Graphs help us understand

One of the Rathenau Instituut's tasks is to visualise the Dutch knowledge eco-system. We do that with numbers and with graphs. Senior researcher Alexandra Vennekens is one of the people behind www.rathenau.nl/en/science-in-figures, our new site launched in 2016. Here she looks back at her four favourite graphs of 2016.

The Netherlands ranks second in the world in terms of citation impact

"The citation impact score is a measure of the quality of scientific output. It is an indicator that shows how often a publication is cited. I love the fact that the Netherlands has such a high score – a solid second place in the world rankings. The quality of scientific output in the Netherlands is outstanding. It's only fair to note that the citation impact score has received some criticism. The humanities and similar areas of scholarship are underrepresented. In addition, it doesn't show how that scientific knowledge is applied in the real world."

Citation impact of all publications and international co-publications (WoS)



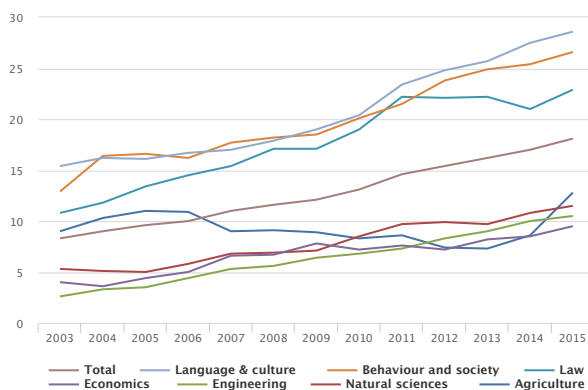
Source: Web of Science / CWTS

Notes: Citation impact scores normalised per field (world average = 1.0). All publications in 2010-2013 and international co-publications in 2009-2012.

Share of female professors is increasing slowly

"You see here that the share of female professors has increased across all fields of science. Two fields, language & culture and behaviour & society, have the most female professors. This graph doesn't include the medical sciences. Women also score favourably in these fields but we lack consistent multi-year series of them. On average, almost twenty percent of all professors are female. The Minister of Education, Culture and Science wants to see that percentage increase in the years ahead. We show what steps may be effective."

No. of university professors by field, in persons



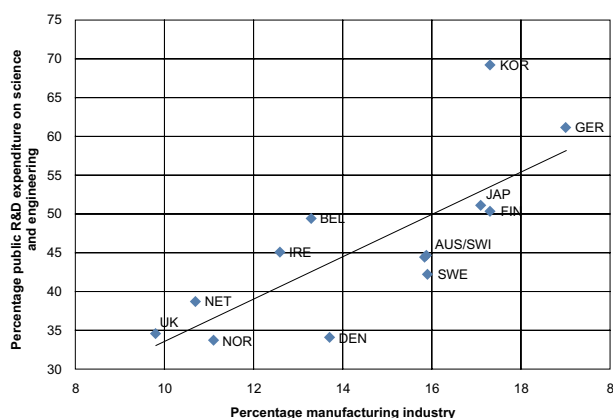
Source: VSNU / WOPI

Notes: Excluding professors affiliated with university medical centres.

Dutch spending on science and engineering compared with the United Kingdom

"This graph was constructed after MPs Eppo Bruins and Pieter Duisenberg submitted a motion to the House of Representatives. The Netherlands spends relatively little of its R&D funding on science and engineering. The graph shows that this is related to our having a relatively small manufacturing industry and a relatively large service economy. In that sense, we're similar to the United Kingdom. The next question is whether the Netherlands should be spending relatively little on science and engineering. The political decisions are up to the House and the minister, who are presently discussing the subject."

Relationship between % manufacturing in national economy and % public R&D expenditure in science and engineering

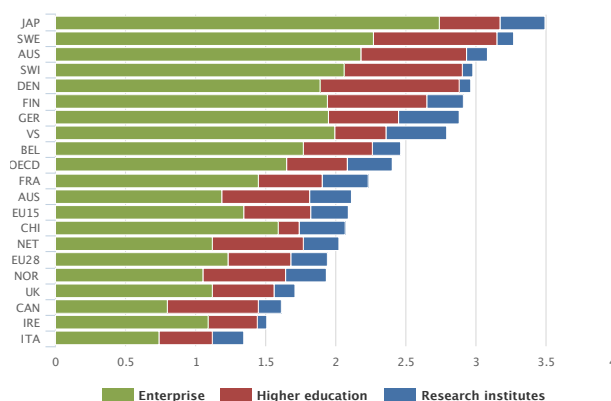


Source: OECD/MSTI data on nature of economy according to the International Standard Industrial Classification of All Economic Activities (% manufacturing).

Netherlands not spending agreed 2.5 percent on R&D

"This graph also led to a parliamentary debate. The Netherlands has agreed internationally to spend 2.5% of its Gross Domestic Product (GDP) on Research & Development (R&D). That is the sum total of Dutch investment in R&D, financed by government, enterprise and other sources (domestic and foreign), excluding R&D tax incentives. Our figures show that the Netherlands is not spending that percentage. In fact, we expect the Netherlands' GDP to increase in the years ahead, something that will further shrink the percentage of R&D expenditure. Based on our information, the House of Representatives can demand that steps should be taken".

R&D expenditure by operational sector, as a % of GDP, 2015



Source: OESO, MSTI database

Notes: Canada and Ireland: 2014; Australia: 2013; Switzerland: 2012. USA: excluding most capital expenditure. The private non-profit sector is part of the research institutions sector.

Collecting facts and figures

One of the basic questions that www.rathenau.nl/en/science-in-figures must answer is: which facts and figures are important? To determine this, the Rathenau Instituut works with a liaison group made up of delegates from the ministries and other organisations. At the moment, there are delegates from the Ministries of Education, Culture & Science, Economic Affairs, Infrastructure & the Environment, and Health, Welfare & Sport, and from the Advisory Council for Science, Technology and Innovation (AWTI), the Royal Netherlands Academy of Arts and Sciences, the Netherlands Organisation for Scientific Research (NWO), employers' federation VNO-NCW, the Association of Universities in the Netherlands (VSNU) and the Association of Universities of Applied Sciences. The Rathenau Instituut is also participating in a work group about data and indicators, and we are discussing this with our partners in Europe and the OECD.



Alexandra Vennekens

Our impact

The Rathenau Instituut's task is to “contribute to public debate and to help shape political opinion about trends in science and technology”. In 2016, we briefed Parliament, our reports led to questions in the House of Representatives, and we were “quoted” regularly.

Reports for the Dutch Parliament

The Rathenau Instituut regularly prepares special publications for the Dutch Parliament. For example, in January we sent a letter to the Senate in advance of a debate about a government committee that is to investigate the parliamentary system in the Netherlands. That same month, we published *Bescherm de digitale patient* (Protecting digital patients). In April, we prepared a report on the broadening of science policy. In November, we published *Moderne biotechnologie in Nederland* (Modern biotechnology in the Netherlands, 22 pages) and the shorter *Biotechnologierevolutie vraagt om politieke visie* (The biotechnology revolution demands political vision, 3 pages). In December we drafted *De maatschappelijke impact van wetenschap: naar een systematische aanpak*. (Science's impact on society: towards a systematic approach).

“The Rathenau Instituut will draft a report of these consultations and I will provide more information about the frame of reference for taking decisions on the cultivation of GM crops.”

Minister for Agriculture Martijn Van Dam (Economic Affairs) on 26 February 2016 in response to questions raised by MPs Sjoera Dijkers and Henk Leenders concerning new technologies for cultivating genetically modified organisms (GMOs). The report to which Van Dam referred is *Afwegingskader nationale teeltbevoegdheid gg-gewassen* (Framework for assessing national authorisation for cultivating GM crops). Based in part on our report, a committee on GM cultivation has been established.

“The AWTI and also Rathenau have supplied us with valuable reports. Their reports have been highly significant for us.”

Minister Henk Kamp (Economic Affairs) on 11 February 2016 during a general meeting of the House Standing ▶



“Like others, the Rathenau Instituut has noted that university careers depend more on how academics perform as teachers than as researchers these days,” according to Minister Jet Bussemaker (Education, Culture and Science) in June 2016 in response to questions raised in the House.

Committee on Economic Affairs concerning private-sector policy. The Minister is referring to such reports as *R&D goes global*.

“Both studies, by the Rathenau Instituut and the Scientific Council for Government Policy, are exceptionally valuable.”

Minister Lodewijk Asscher (Social Affairs and Employment) speaking on 28 April 2016 during a general meeting of the House Standing Committee for Social Affairs and Employment concerning labour market policy. The Rathenau study to which the Minister is referring is *Working on the robot society*. We drafted that report at the request of the House of Representatives. We also made an important contribution to the Council's report.

“Like others, the Rathenau Instituut has noted that university careers depend more on how academics perform as teachers than as researchers these days.”

Minister Jet Bussemaker (Education, Culture and Science) on 14 June 2016 in response to questions raised by MP Van Meenen following publication of an article in Dutch newspaper Trouw, “Topdocenten kraken onderwijs Nederlandse universiteiten” (Top instructors criticise teaching in Dutch universities). The Minister is referring here to the Rathenau Facts & Figures publication *Drijfveren van onderzoekers* (What motivates researchers).

“The Government will also bear in mind that, in its report R&D goes global, the Rathenau Instituut indicates how much easier it is becoming to move business activities into and out of the Netherlands.”

State Secretary Eric Wiebes (Finance) on 19 February 2016 in his letter to the House of Representatives regarding the evaluation of the “Innovation Box” tax incentive.

“Implementation of this motion has been entrusted to the Rathenau Instituut. The House will receive the first survey in the autumn, which will include an international comparison.”

Minister Jet Bussemaker (Education, Culture and Science) on 23 September 2016 in a letter to the House concerning the status of a number of motions pertaining to science policy. The motion she is referring to was

submitted by MPs Eppo Bruins and Pieter Duisenberg and concerned monitoring the scale of expenditure in science, engineering, the humanities and the social sciences. In November 2016, the Rathenau Instituut had published its factsheet *R&D expenditure and capacity by field of science*. ■

Six reports

20 April 2016 will go down in history as the day that saw the largest number of Rathenau Instituut reports being discussed at a single meeting. It was the day of the joint general meeting of the House Standing Committee for Education, Culture and Science and the House Standing Committee for Economic Affairs. No less than six reports were covered. They were *TWIN 2014-2020*, *Spinning Plates*, *Facts & Figures: PKOs*, *Keuzes voor de wetenschap* (Choices in science), *Valorisation: researchers do more than they realise*, and *R&D goes global*. In a report for Parliament, we explained the relationship between these reports.

Working on the robot society

During a general meeting in April 2016 of the House Standing Committee for Social Affairs and Employment concerning labour market policy, the Rathenau Instituut's name came up **nine times**. The MPs made frequent reference to our report *Working on the robot society*.

Vision for science en route to 2025

The Rathenau Instituut was mentioned **ten separate times** in the “Vision for Science” progress report, *En route to 2025*, by the Ministry of Education, Culture and Science (February 2016). The progress report referred, for example, to our reports *Valorisation: researchers do more than they realise*, *R&D goes global*, and *Trust in science*.

International

Big data, artificial intelligence and robots raise questions about ethics and human rights. The Rathenau Instituut has an international reputation as a leader in this domain. We are frequently asked to produce studies and give presentations that will contribute to the global debate. Below we describe some of our international activities.

German Ethics Council, WHO, UNESCO – Rules for the digital human park

The German Ethics Council, the WHO and UNESCO asked the Rathenau Instituut to write a background paper on technologies and big data for the 11th Global Summit of National Ethics / Bioethics Committees. The summit took place in Berlin in March 2016. We presented our study *Rules for the digital human park*, in which we analyse the international debate on the latest forms of human genetic engineering and “persuasive” technology, i.e. technology that influences our behaviour.

Parliament of Flanders – Patient dossiers

In March 2016, we presented our ideas about patient dossiers to the Parliament of Flanders.

United States – Broader impact

In April 2016, we ran a session on “Impact in the EU” during the NABI Broader Impacts Summit in Philadelphia. The NABI is the National Alliance for Broader Impacts.

Amsterdam – Dutch presidency of the EU

In April 2016, the Rathenau Instituut contributed to the Open Science Presidency Conference in Amsterdam. The conference was organised within the context of the Netherlands’ presidency of the European Union. We prepared the sessions on impact and Melanie Peters was an invitee and sat on an expert panel.

European Commission – Synthetic biology, responsible science

In 2016, the Rathenau Instituut was involved in various European Commission research projects intended to encourage European research and innovation. The projects concerned synthetic biology (Synenergine) and Responsible Research and Innovation (RRI tools). Melanie Peters addressed the closing meeting in June 2016. We also completed a study for the EC’s

Directorate-General for Health and Food Safety on the EU’s responsibility for European public health. We will present the study in 2017.

Brussels – INGSA meeting

In late September 2016, Melanie Peters was an invited speaker at the first European meeting of the INGSA on evidence-based policy. The INGSA is the International Network for Government Science Advice.

UNESCO – Big data

In September 2016, we gave a presentation on big data at UNESCO headquarters in Paris. The presentation took place during a joint meeting of UNESCO’s International Bioethics Committee and Intergovernmental Bioethics Committee and the World Commission on the Ethics of Scientific Knowledge and Technology.

Council of Europe – Human rights in the robot era

In September 2016, we gave a presentation on technology during a public hearing of the Parliamentary Assembly of the Council of Europe (PACE) in the Ukrainian parliament in Kiev. The PACE considers the relationship between human rights and technologies such as artificial intelligence and robotics a priority. The PACE Committee on Culture, Science, Education and Media asked the Rathenau Instituut to write an expert paper on human rights in the robot age. In December, we presented our findings in Paris. The expert paper will be published in early 2017, after the committee has completed its work.

China – Ethics of DNA technologies

In November 2016, the Beijing Genomics Institute (BGI) organised the 11th International Conference on Genomics. Rinie van Est was invited to address the ethics session on the new technology of CRISPR and genetic modification. We also attended the first meeting of the Asian network for genomics and ethics. ▶



Austria – Open innovation

In November 2016, several Rathenau Instituut researchers gave presentations during Open Evaluation 2016, the largest European conference on the evaluation of research, technology and innovation policy. Jasper Deuten and Leonie van Drooge presented the paper *Joint evaluation for joint governance of challenge-oriented research*. Elizabeth Koier presented findings from our report *Spinning plates*.

Denmark – Course instructor on the impact of the social sciences

In November 2016, Barend van der Meulen taught a three-day course entitled Evaluation and Monitoring of the Societal Impact of Science. The course was organised by the international Network for Advancing and Evaluating the Societal Impact of Science.

European sister organisations – Future of labour

The annual conference of our European network of sister organisations was organised by our Austrian counterpart, the ITA. The theme was the future of labour in the digital age. Rathenau researcher Rinie van Est spoke to the conference about our report *Working on the robot society*. In November, the joint organisations published the report *The Future of Labour in the Digital Era. Ubiquitous Computing, Virtual Platforms, and Real-time Production*.

South Korea – Emerging technologies

In late 2016, South Korea's Science and Technology Policy Institute (STePI) and Korea Advanced Institute of Science & Technology (KAIST) organised a workshop on Technology Assessment in the Age of Uncertainty. Rathenau researcher Rinie van Est gave a presentation on how the Rathenau Instituut encourages the debate about emerging technologies. The next day, he showed how we deal with technology assessment in the Netherlands and Europe.

Belgium – The footprint of the humanities

In December 2016, Leonie van Drooge headed a session entitled "Crossing boundaries: how does interdisciplinarity increase impact?" during the "Footprint of social sciences and humanities" event at the University of Ghent.

European Parliament – E-democracy and 3D bioprinting

The European Parliament's STOA research office (Science and Technology Options Assessment) asked the Rathenau Instituut to carry out two studies whose results will be presented to MEPs in 2017. The studies concern e-democracy and 3D bioprinting. We are collaborating with sister institutes in Germany, Austria and elsewhere in Europe. ■

The year 2016 in review: some highlights

2016: A variable mix

March: Science in Figures website

Nora van der Wenden, Director of Research and Science Policy at the Ministry of Education, Culture and Science, officiated at the inaugural ceremony on 23 March 2016 for our Science in Figures website. A user's panel tested the special landing page www.rathenau.nl/en/science-in-figures. The site provides clear graphs that show the status of science in the Netherlands.

April: OSCAR, the artificial organism

OSCAR is a science fiction story about a living organism made of human cells, built by the equally fictional researcher Cornelis Vlasman. The purpose of the project is to get people thinking about synthetic biology. The project trailer, *The Modular Body*, features a fictional talk show in which Rathenau researcher Virgil Rerimassie discusses the societal significance of OSCAR.

June: Spinning plates on Nieuwsuur

Nieuwsuur, a nightly television news analysis programme, interviewed researcher Edwin Horlings about how science funding is distributed. Horlings is one of the authors of *Spinning plates* an in-depth study of the way in which Dutch university research is funded.

June: Synthetic biology event

The Rathenau Instituut and other European members of the Synenergine Consortium organised a major public event on 24 and 25 June 2016 focusing on the opportunities and risks of synthetic biology. The event, *Visions of the Future*, took place in Amsterdam's NEMO Science Museum.

July: Philosophical quintet

On 3 July, director Melanie Peters appeared on the television programme *Filosofisch Kwintet* by broadcasting association HUMAN on the public broadcasting service NPO 1. This episode was about the independence of science and scientists.

July: One Minute Bodyscan

The One Minute Bodyscan is an art installation that the Rathenau Instituut presented at various summer music festivals. People who take the scan see how they can be tracked without their even being aware of it. Who owns the tracking data? And do they really want to share that data with others? ▶



Visitors at the *Recalibrating Excellence* event, organised in October by the Rathenau Instituut and the Centre for Science and Technology Studies (CWTS).

August: Big data at Lowlands

Researcher Jelte Timmer addressed an audience at the Lowlands music festival about how big data influences our lives. "In an age in which there's an app for everything, the challenge will be to not quantify every experience," he argued.

September: 30th anniversary event

The Rathenau Instituut turned 30 in 2016. We marked the occasion on 14 September 2016 with a post-summer event for our network and a well read longread on Gerhart Rathenau. The theme of the event was the future of science and technology and a globalising world: *Local ethics for global technology*.

October: Synthetic biology guide

The Rathenau Instituut produced the *iGEMmers Guide to the Future* for aspiring synthetic biologists. The guide offers support in ensuring responsible research and innovation. It was presented during the iGEM Giant Jamboree in Boston, a worldwide contest for students of synthetic biology.

October: Pipo the Clone on the TV news

On 24 October 2016, broadcasting association BNN announced that it had had a bulldog cloned in South Korea for a television for a television programme. It called the dog "Pipo the Clone". Public channel news contacted director Melanie Peters for comment.

November: #Academic Varieties

The Rathenau Instituut used the hashtag #AcademicVarieties to call on Twitter and Instagram users to submit their ideas for improving the science system. Dozens of young scientists responded to the call, which followed the Recalibrating Excellence event organised in October by the Rathenau Instituut and the Centre for Science and Technology Studies (CWTS).

November: Live broadcast on the impact of robotisation

On 17 November, Melanie Peters spoke during the live-stream NRC Live event on the impact of robotisation. According to the Rathenau Instituut director, we must guard against computers and robots telling us what to think and what to do. Linda Kool also featured as a guest speaker. ■

Quality policy

Given the importance and impact of what we do, it is crucial for the Rathenau Instituut to guarantee the quality of its work, not only in terms of substance but also with respect to methodology and relevance. We safeguard the substantive and methodological quality of our work by continuously testing and reflecting on crucial methods, conducting internal reviews, and calling in external experts. We safeguard the relevance of our work by interacting with stakeholders, project supervisory committees and our Programme Panel. By conducting internal evaluations of projects and developing internal learning and skills development pathways, we aim to build a strong quality culture and make continuous quality improvements. To ensure the independence of the institute, we first consider whether an external assignment helps us fulfil our institute's objectives, including publication of the results.

Sustainability

The Rathenau Instituut has a policy of reducing the environmental footprint of its activities. We make as little use of paper (printing, printed matter) as possible. Where possible, our staff members take public transport, both for commuting and for professional trips. We have done away with bottled water and now use tap water, and at our request a number of charging stations for electric cars have been installed in our shared car park.

Open access

The Rathenau Instituut's mission is to encourage public debate and the formation of political opinion on science and technology. We therefore do our utmost to publish the results of our studies and the data that we have used. All our reports, background studies and software are open access publications. We make scientific articles and book chapters freely available in so far as we can justify the cost of doing so within the context of the institute's mission. Research data is made available pursuant to statutory provisions and ethical research standards concerning the rights of third parties, privacy and copyright.

2016 in figures

Website

110,625

visits

9,218

visits per month



369,769

page views

30,814

page views per month

18,306

publication downloads

790x

*Praktijkgericht onderzoek
bij lectoraten van
hogescholen*

(Practice-based research
at universities of
applied sciences)

621x

Spinning
plates

613x

Working on the
robot society



Most read long reads in 2016



It's not about technology,
it's about us!



Valorisation: researchers
do more than they realise

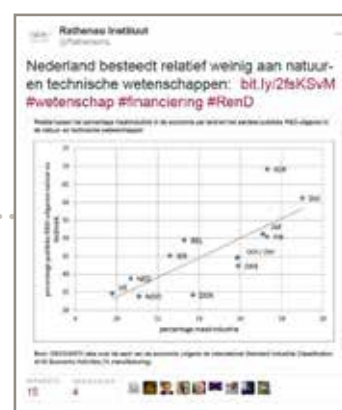


Science, journalism and
media logic

Most retweeted

15

verbatim retweets
and multiple
paraphrased versions



Social media



5,500

followers on Twitter
up 600 on 2015



3,000

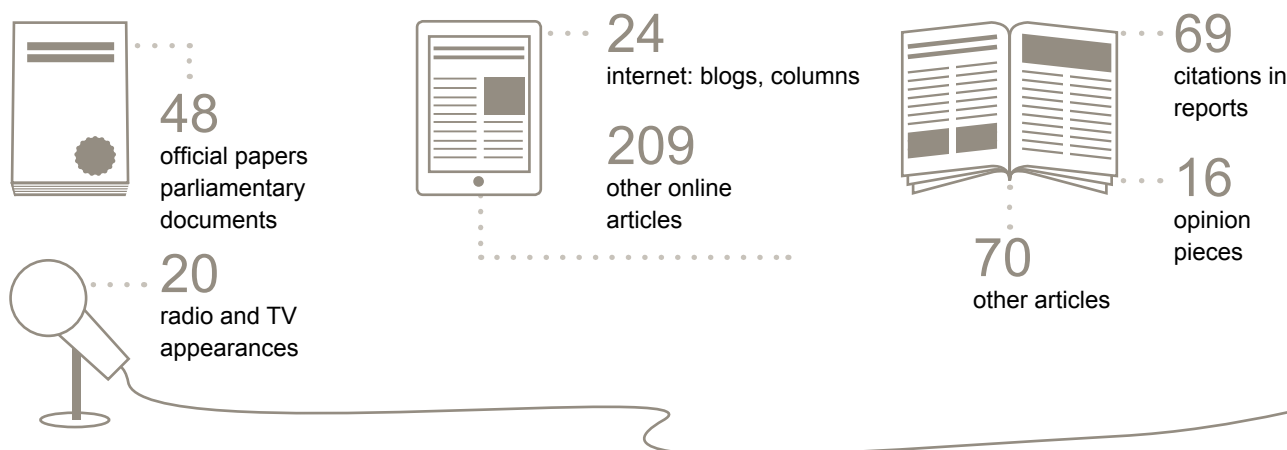
followers on LinkedIn
up 600 on 2015



700

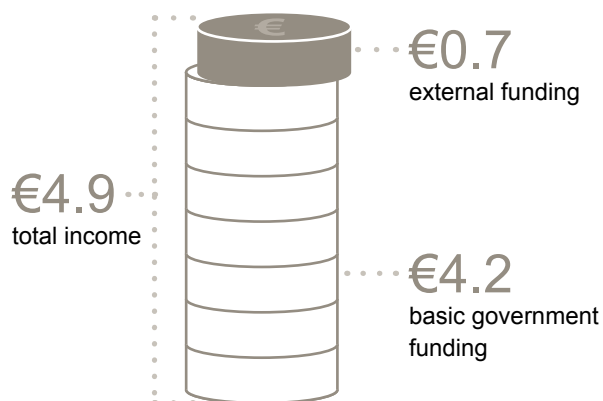
Facebook fans
up 100 on 2015

Impact



Funding

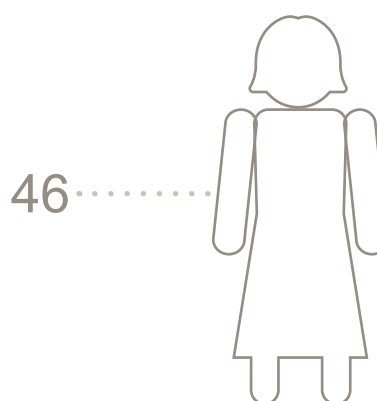
Income in millions of euros



The Rathenau Instituut's basic funding is provided by the Ministry of Education, Culture and Science (and disbursed by the Royal Netherlands Academy of Arts and Sciences). In addition, the institute receives external funding by conducting contract research for the European Parliament, the European Commission, the Netherlands Organisation for Scientific Research (NWO), Dutch ministries and provincial authorities. In 2016, its external funding represented 16% of its basic funding. The institute is making efforts to increase that percentage to 25% maximum. In 2016, it accumulated more assets than had been budgeted. That was specifically owing to extra wage compensation received from the Ministry of Education, Culture and Science and other extra assets. With one exception, all the projects listed in the 2015-2016 work programme have been completed. Together with some of the strategic projects and the external projects, they were completed at 88% of the budgeted cost. Staffing and publication costs were lower owing to prolonged job vacancies and the transition to digital publishing.

Staff

FTEs at year-end 2016



In 2016, the staff complement consisted of 46 FTEs. The actual number of employees was smaller than this figure owing to a number of job vacancies that were filled by external parties. Staff numbers will increase again in 2017. In 2016, we had ten trainees and two student assistants. 70% of our employees are female and 30% are male. The sickness absenteeism figure was 4.47%. 48% of our researchers are permanent staff. A few years ago, that was only 20%.

Appendices



1 Publications

Reports, books and academic articles

1. **Asveld, L. & D. Stermerding.** *Algae oil on trial: conflicting views of technology and nature.* - The Hague: Rathenau Instituut, 2016. - 34 p.
2. **Bos, J. & G. Munnichs.** *Digitalisering van dieren: verkenning precision livestock farming.* - Den Haag: Rathenau Instituut, 2016. - 43 p.
3. **Deuten, J., L. Koens, P. Faasse & B. van der Meulen.** *Protocol voor de monitoring en evaluatie van de Toegepast Onderzoeksorganisaties in Nederland.* - Den Haag: Rathenau Instituut, 2016. - 47 p.
4. **Duits, L. & A. Pleijter.** *"Uit onderzoek blijkt ...": een inventarisatie van wetenschaps-journalistiek in Nederlandse media.* - Den Haag: Rathenau Instituut, 2016. - 74 p.
5. **Eskens, S., J. Timmer, L. Kool & R. van Est.** *Beyond control: exploratory study on the discourse in Silicon Valley about consumer privacy in the Internet of Things.* - The Hague: Rathenau Instituut, 2016. - 51 p.
6. **Est, R. van & A. van Waes; met medew. van A. de Vries.** *Elf lessen voor een goede Energiedialoog.* - Den Haag: Rathenau Instituut, 2016. - 99 p.
7. **Geesink, I., M. Heerings & S. van Egmond.** *De meetbare mens: digitaal meten van het zieke en gezonde lichaam.* - Den Haag: Rathenau Instituut, 2016. – e-book; chapters may be downloaded separately.
8. **Hessels, L., W. Scholten, T. Franssen en S. de Rijcke.** *Excellent geld: de rol van excellente subsidies bij vier toponderzoeksgroepen in Nederland.* - Den Haag: Rathenau Instituut, 2016. - 90 p.
9. **Koier, E., B. van der Meulen, E. Horlings & R. Belder.** *Chinese borden: financiële stromen en prioriteringsbeleid in het Nederlandse universitaire onderzoek.* - Den Haag: Rathenau Instituut, 2016. - 102 p.
10. **Koier, E., B. van der Meulen, E. Horlings & R. Belder.** *De ontwikkeling van vakgebieden in Nederland: de effecten van beleid op het Nederlandse onderzoeksprofiel.* - Den Haag: Rathenau Instituut, 2015. - 74 p.
11. **Korsten, J. & R. van Est.** *Knap kantelen: historisch perspectief op de rol van technologie op diverse economische sectoren in Zuid-Holland: essay.* - Provincie Zuid-Holland, 2016. - 25 p.
12. **Korthagen, I.** *Wakers van de wetenschap: over het belang en de functies van wetenschapsjournalistiek.* - Den Haag: Rathenau Instituut, 2016. - 35 p.
13. **Maclaine Pont, P., R. van Est & J. Deuten.** *Met beleid vormgeven aan socio-technische innovatie: essay in opdracht van de directie Kennis en Innovatie Strategie van het Ministerie van Infrastructuur en Milieu.* - Den Haag: Rathenau Instituut, 2016. - 35 p.
14. **Maclaine Pont, P., R. van Est & J. Deuten.** *Shaping socio-technical innovation through policy: essay commissioned by the Department of Knowledge, Innovation and Strategy of the Dutch Ministry of Infrastructure and the Environment.* - Den Haag: Rathenau Instituut, Den Haag 2016. - 40 p.
15. **Munnichs, G., H. de Vriend & D. Stermerding.** *Afwegingskader nationale teeltbevoegdheid gg-gewassen: verslag van een stakeholderdialoog.* - Den Haag: Rathenau Instituut, 2016. - 49 p.
16. **Rerimassie, V., R. van Est, D. Stermerding, I. van Keulen, Z. Robaey, M. Peters & I. Malsch.** *Moderne biotechnologie in Nederland.* - Den Haag: Rathenau Instituut, 2016. - 22 p. (Background memo for General Consultation on biotechnology on 9 November 2016, rescheduled for 2017)
17. **Rerimassie, V., D. Stermerding, E. de Bakker & R. van Est.** *Van draagvlak naar meer: ontwerp van een maatschappelijke incubator voor beloftevolle (nano)technologieën.* - Den Haag: Rathenau Instituut, 2016. - 66 p.
18. *The Future of Labour in the Digital Era: Ubiquitous Computing, Virtual Platforms, and Real-time Production* - Wenen: European Parliamentary Technology Assessment, 2016 p 41-47.

Feiten & Cijfers / Facts & Figures

1. **Dorst, H., J. Deuten & E. Horlings.** *De Nederlandse wetenschap in de European Research Area.* - Den Haag: Rathenau Instituut, 2016. - 40 p. - (Feiten & Cijfers; February 2016)
2. **Jonge, J. de.** *Praktijkgericht onderzoek bij lectoraten van hogescholen.* - Den Haag: Rathenau Instituut, 2016. - 24 p. - (Feiten & Cijfers; May 2016)
3. **Jonge, J. de.** *Trust in Science in the Netherlands.* - The Hague: Rathenau Instituut, 2016. - 26 p. - (Facts & Figures; March 2016)
4. **Koens, L., C. Chiong Meza, P. Faasse & J. de Jonge.** *De publieke kennisorganisaties.* - Den Haag: Rathenau Instituut, 2016. - 40 p. - (Facts & Figures; March 2016)
5. **Koens, L., C. Chiong Meza, P. Faasse & J. de Jonge.** *Public Knowledge Organisations in the Netherlands.* - The Hague, Rathenau Instituut. - 52 p. - (Facts & Figures; October 2016)
6. **Steen, J. van & A. Vennekens.** *Voorpublicatie Totale Investerings in Wetenschap en Innovatie (TWIN) 2014-2020.* - Den Haag: Rathenau Instituut, 2016. - 7 p.
7. **Vennekens, A. & J. van Steen.** *Totale Investerings in Wetenschap en Innovatie 2014-2020.* Den Haag: Rathenau Instituut, 2016. - 30 p. - (Feiten & Cijfers; April 2016)

We also published dozens of factsheets and data publications op: www.rathenau.nl/en/science-in-figures

Long reads

1. **Drooge, L. van & S. de Jong.** *Valorisation: researchers do more than they realise.* - The Hague: Rathenau Instituut, 2016
2. **Est, R. van & L. Kool.** *It's not about technology, it's about us!* - The Hague: Rathenau Instituut, 2016
3. **Messer, P.** *De man die Nederland aan de personal computer kreeg.* - Den Haag: Rathenau Instituut, 2016
4. **Stemerding, D. & L. Asveld.** *Industrial biotechnology under the spotlights.* The Hague: Rathenau Instituut, 2016
5. **Stemerding, D.** *Kan synthetische biologie bijdragen aan een duurzame economie?* - Den Haag: Rathenau Instituut, 2016

Reports for the Dutch Parliament

1. Bescherm de digitale patiënt: aandachtspunten naar aanleiding van onderzoek 'De meetbare mens' (January 2016)
2. Verbreding van het wetenschapsbeleid (April 2016)
3. Biotechnologierevolutie vraagt om politieke visie (November 2016)
4. De maatschappelijke impact van wetenschap: naar een systematische aanpak (December 2016)

Reports

1. Beter nadenken over de gevolgen van synthetische biologie: verslag van het debat "Synthetic biology: visions of the future", dat plaatsvond op 24 juni 2016 tijdens het Synenergine Forum. - Den Haag: Rathenau Instituut, 2016. - 4 p.
2. **Timmer, J.** *Meer data, minder risico's? Verslag expertmeeting Rathenau Instituut en Verbond van Verzekeraars,* 18 January 2016. - Den Haag: Rathenau Instituut, 2016. - 2 p

2 Projects

The Rathenau Instituut carries out research at the interface of science, technology and society. The projects below are listed under the five themes of our 2015-2016 work programme.

Theme 1: Quantified self

Apps, smartphones and social media. Technology is becoming an increasingly important part of our lives. It has many benefits – convenience, safety, autonomy – but it also raises concerns. Who has access to all that data? Who is making money off it? Is our freedom being restricted? The Rathenau Instituut wants to put the implications of this technological revolution on the political and public agenda.

Big data and smart decision-makers (smart algorithms)

Project team: Sarah Eskens, Rinie van Est, Linda Kool, Jelte Timmer

Description: Rapid advances are being made in big data, but we do not yet know precisely how it will impact enterprise, society and politics. Myths also appear to be emerging about it. Businesses and the political world want clarity about what big data can mean for society. What opportunities and risks does it offer for innovation? And to what extent is innovation actually being driven by big data? The Rathenau Instituut has worked with relevant stakeholders to examine what the responsible use of big data means in real life.

Stakeholders: Combined forces of enterprise, science, government and CSOs. Important parties are the Data Science Center at Eindhoven University of Technology, the Netherlands Office of Science & Technology (NOST) in San Francisco, and the Dutch Association of Insurers.

In 2016... we organised a workshop with the Dutch Association of Insurers on big data and responsible innovation, and one of our trainees investigated how various companies in Silicon Valley deal with big data.

Emerging markets for human biological material

Project team: Ingrid Geesink (external members: Arlinke Bokhorst (TRIP/Sanquin), Theo de By (European Foundation Tissue Banking), Julia Stein (Deutsches Herzzentrum Berlin DHB))

Description: The purpose of this study is to furnish information to the European Commission (DG Health) as it prepares for a review of current EU legislation governing the safety and quality of tissues and cells. The report provides facts and figures, an economic analysis and a forecast of trends.

Stakeholders: The primary user is the European Commission and competent authorities in the 28 EU member states. Secondary target groups are tissue and cell banks, transplantation and transfusion services, policymakers and rule-making bodies concerned with tissue and cell technology, professional clinical and scientific organisations, industry and patient organisations.

In 2016... we presented the report to the European Commission and published it online

Ethical aspects of the digitalisation of society (Gerken's motion)

Project team: Rinie van Est, Linda Kool, Jelte Timmer

Description: In a motion submitted by MP Gerken's, the Senate asked the Minister of Foreign Affairs and Kingdom Relations to order the Rathenau Instituut to study the need for a committee that can advise on the ethical aspects of the digitalisation of society. The project supports Parliament and the Government in the question of how to safeguard the ethical issues surrounding digital technology.

Stakeholders: Senate and House of Representatives, Ministry of Foreign Affairs and Kingdom Relations.

In 2016... we interviewed the stakeholders in science, ethics, policymaking and civil society and prepared our report for publication.

Cybersecurity

Project team: Linda Kool, Matthijs Kouw, Geert Munnichs

Description: At the request of the National Coordinator for Security and Counterterrorism and the Netherlands General Intelligence and Security Service (AIVD), we are analysing trends and developments in cybersecurity. What can we say about our growing reliance on ICT, about cyberthreats and about our digital resilience? We look ahead to 2020 and make recommendations for how society should deal with cyberthreats.

Stakeholders: Experts, enterprise, government, CSOs, policymakers and MPs.

In 2016... we carried out a study of the literature, conducted interviews, performed a trend analysis and international comparison, and organised two workshops.

Participatory and direct democracy

Project team: Ira van Keulen, Iris Korthagen, Geert Munnichs (and fellow European institutes)

Description: The project studies what lessons we can learn from local, national and European efforts to use digital tools in decision-making processes. The project is linked to an earlier study that the institute carried out in the Dutch context.

Stakeholders: European Parliament and other EU decision-making organisations.

In 2016... we launched the project and gave two workshops. Publication will take place after we present the project results to the European Parliament in 2017.

Theme 2: Smart society

Many sectors are using science and technology to make processes better, more efficient and more sustainable. But something more is required to get smart systems off the ground. Do people really want a robot at their bedside when they are sick? What if self-driving cars get into accidents? The Rathenau Instituut investigates how innovation can help society make progress.

Synthetic biology

Project team: Rinie van Est, Virgil Rerimassie, Dirk Stermerding (external member: LEI Wageningen UR)

Description: This project concerns the societal aspects of synthetic biology and how to engage people in the subject. The project activities tie in with the EU Synenergene project (2013-2017). The Rathenau Instituut is heading this platform, whose members include iGEM Foundation, the Athena Institute (VU University Amsterdam), Biotechnology & Society (Delft University of Technology), LIS Consult, FLINT University of South Denmark, Woodrow Wilson International Centre for Scholars (USA) and the University of Bergen (Norway). The Synenergene consortium has more than twenty members.

Stakeholders: Consortium partners, policymakers, enterprise, parliament, government and the public at large.

In 2016... we organised an interactive workshop on antibiotic resistance and published a long read about industrial biotechnology and a background study, Algae oil on trial. We also organised the international Synenergene Forum in Amsterdam, attended the meeting on Veilig verder met synthetische biologie (Proceeding safely with synthetic biology) with the National Institute for Public Health and the Environment (RIVM), provided coaching at the iGEM Jamboree in Boston, and organised an expert meeting for Dutch MPs.

Societal incubator on nanofood

Project team: Rinie van Est, Virgil Rerimassie, Dirk Stermerding (external member: LEI Wageningen UR)

Description: The NanoNextNL consortium has asked the Rathenau Instituut to explore the possibility of "societal incubators" focusing on nanotechnology. The study involved the conceptual development of a form of open dialogue concerning potentially controversial uses of nanotechnology. Among our partners in this study were Wageningen University & Research, Friesland Campina, Unilever, FNLI, the nanotechnology work group of employers' federations VNO-NCW/MKB-Nederland, environmental organisation Natuur & Milieu, the Ministry of Infrastructure and the Environment, and the Ministry of Economic Affairs.

Stakeholders: The dialogue focuses on stakeholders in the area of nanofood i.e. those involved on behalf of enterprise, CSOs and the national government.

In 2016... we had an informative workshop and published our final report, Van draagvlak naar meer.

Stakeholder dialogue on national authorisation to cultivate GM crops

Project team: Geert Munnichs, Dirk Stermerding (external member: Huib de Vriend (LIS Consult))

Description: At the request of the Ministry of Economic Affairs, the Rathenau Instituut organised a stakeholder consultation on an assessment framework for decision-making concerning national authorisation to cultivate genetically modified crops. The consultation resulted in a set of building blocks for constructing this framework: which criteria should be considered in the assessment, and how should they be weighted? Based on this outcome, the State Secretary for Economic Affairs has decided to establish a committee to prepare such decisions on GM cultivation.

Stakeholders: Ministry of Economic Affairs, Greenpeace, Bionext, Plantum, Hollandbio, Union of Dutch Crop Farmers (NAV), Dutch Federation of Agricultural and Horticultural Organisations (LTO), Netherlands Potato Organisation (NAO), Natuur & Milieu, Youth Food Movement and Network of Young Dutch Farmers (NAJK).

In 2016... we presented the final report to the Ministry of Economic Affairs and submitted the report to the House of Representatives.

Responsible innovation in Dutch potato breeding

Project team: Rosanne Edelenbosch, Geert Munnichs, Dirk Stermerding (external members: Paul Struik (WUR), Sjaak Swart (RUG), Pim Lindhout (Solynta))

Description: This project investigates innovation scenarios in potato farming that (1) contribute to productive and sustainable potato cultivation, (2) boost public support for the potato production system and (3) make new crops available worldwide. The project, carried out within the context of the NWO's Responsible Innovation programme, is helping to fuel a constructive public debate about agricultural innovation that does not involve genetic modification.

Stakeholders: Scientists, the potato sector, CSOs and policymakers.

In 2016... we launched the project, held a series of interviews with stakeholders, met with the valorisation panel, and were involved in the open house organised by Solynta.

Robots in the workplace

Project team: Rinie van Est, Linda Kool

Description: This project shows how Dutch enterprises are utilising new technology, e.g. robots and artificial intelligence. What choices do businesses make regarding technology and labour, and why? How do organisations prepare strategically to work with robots? And how do employees prepare for this change? The Rathenau Instituut is conducting the study at the request of Stichting Management Studies. We are cooperating with Tilburg University and Erasmus University Rotterdam.

Stakeholders: Combination of employers, employees, academics and policymakers.

In 2016... we wrote the draft report.

Theme 3: Borderless innovation

Research and innovation are not constricted by national or regional borders. We see research institutes, companies and public authorities come together and form regional or local clusters. In addition, there is the growing importance of research and innovation funding from the European Union. The Rathenau Instituut is exploring the impact of these trends on national research and innovation policy.

Practice-based research at universities of applied sciences

Project team: Jos de Jonge

Description: This project produced the first systematic overview of how practice-based research is organised and embedded at Dutch universities of applied sciences (hogescholen) and what subjects it concerns. This complements earlier studies in which the Rathenau Instituut explored research at research universities, university medical centres and public knowledge organisations. The senior lecturers (i.e. professors) at universities of applied sciences function as knowledge brokers in the regional innovation system.

Stakeholders: Dutch science organisations, universities of applied sciences, Parliament, ministries, the media.

In 2016... we published our report, discussed the results and conclusions with various organisations, and contributed to a meeting of senior lecturers at HAN University of Applied Sciences.

Vocational Education Forum

Project team: Jos de Jonge (external members: staff of other organisations)

Description: Over the course of several meetings, the Forum contributed to the development of a strategic vision on futureproof vocational education. The Rathenau Instituut is inputting its knowledge of higher education, regional innovation systems, and the societal impact of technological advances. The National Platform Science & Technology took the initiative to establish the Vocational Education Forum. Other members are the Advisory Council for Science, Technology and Innovation (AWTI), the Rathenau Instituut, Kennisland, Hobéon and the National Think Tank.

Stakeholders: Universities of applied sciences and Forum partners.

In 2016... we helped organise the final meeting and write the concluding document on the role that “lectureships” (i.e. professorships) in higher professional education play in regional innovation.

European science system

Project team: Jasper Deuten, Hade Dorst, Pol Maclaïne Pont

Description: This project surveys the European science system and the position of the Netherlands in the European “research area”. We want this project to ensure that discussions about European science policy are based on shared and reliable views of the present situation, especially because the EU is exerting a growing influence on Dutch science.

Stakeholders: Dutch science organisations, Parliament, ministries, the media.

In 2016... we presented our figures during the Dutch presidency of the EU.

International mobility

Project team: Edwin Horlings, Elizabeth Koier, Wout Scholten

Description: This project is meant to explore the internationalisation of Dutch institutions and why foreign researchers come to work in the Netherlands. Knowing the facts about brain gain, brain drain and brain circulation can help us evaluate trends in international mobility.

Stakeholders: Universities, the Ministry of Education, Culture and Science, the House of Representatives, and overarching organisations such as NWO, the Royal Academy, and the Netherlands Organisation for International Cooperation in Higher Education (NUFFIC).

In 2016... we conducted interviews with scientists and policymakers, collected data and figures on migration flows, and wrote the draft report.

Innovation and legislation

Project team: Jasper Deuten, Rinie van Est, Pol Maclaïne Pont, Virgil Rerimassie

Beschrijving: The purpose of the project is to investigate the relationship between radical new technologies and legislation, and to develop a framework for regulating such innovations. There is growing awareness that encouragement and public coordination of innovation requires an overhaul of the rules and legislation.

Stakeholders: Innovators, NGOs, advisory bodies and policymakers who deal with issues related to new science and technology and the effects on society that require (or, conversely, reject) legislation.

In 2016... we wrote an essay for the Ministry of Infrastructure and the Environment and participated in various public and political discussions.

Theme 4: Evidence-based policy

Many social issues are highly complex. Science can help in the search for solutions. Sometimes, however, the use of scientific evidence by policymakers can lead to controversy. Recent examples have included the commotion over the IPCC’s climate reports and the public concern about the HPV vaccination. The Rathenau Instituut is taking a critical look at the relationship between science and policy.

Public knowledge organisations

Project team: Catherine Chiong Meza, Patricia Faasse, Jos de Jonge, Lionne Koens

Beschrijving: The knowledge organisations that are wholly or partly funded by government, such as the Royal Netherlands Meteorological Institute (KNMI) and the National Institute for Public Health and the Environment (RIVM), play a considerable role in knowledge generation and innovation in the Netherlands. Public funding of many of these public knowledge organisations is under pressure, however. How will their public objectives be guaranteed if public funding decreases?

Stakeholders: Public knowledge organisations, ministries, Parliament, the media.

In 2016... we organised a meeting with the directors of public knowledge organisations, published a report with facts & figures, and worked on separate studies focusing on institutes in the health care and water sectors.

Evaluation and monitoring of applied research organisations (“TO2 institutes”)

Project team: Jasper Deuten, Patricia Faasse, Lionne Koens

Description: We worked with the Ministry of Economic Affairs and the six Dutch institutes for applied research (Netherlands Organisation for Applied Scientific Research, DLO agricultural research institutes, Deltares, Energy Research Centre of the Netherlands, Maritime Research Institute Netherlands, and National Aerospace Laboratory) to develop a protocol for evaluating and monitoring them.

Stakeholders: Ministry of Economic Affairs, the other ministries involved, Parliament and the institutes for applied research.

In 2016... we delivered the protocol for evaluating and monitoring the institutes.

Energy dialogues

Project team: Rinie van Est, Arnoud van Waes

Description: Government is aware that choosing to pursue a sustainable supply of energy leads to controversies and resistance. That is why it wants to involve the stakeholders in decision-making at an early stage. The Rathenau Instituut has reviewed the various “energy dialogues” that have taken place in the Netherlands and public participation in those dialogues. Is dialogue always the best way forward, and under what circumstances?

Polymakers at the Ministry of Economic Affairs prepared the “energy dialogues”.

Stakeholders: Polymakers, public administrators and stakeholders in energy projects.

In 2016... we presented our study *Elf lessen voor een goede energiedialoog* (Eleven lessons for an effective energy dialogue) to the Ministry of Economic Affairs.

Ultra-deep geothermal energy

Project team: Rinie van Est, Magda Smink, Arnoud van Waes (external members: Eefje Cuppen and Elisabeth van de Grift (Delft University of Technology), Tamara Metze (Wageningen UR))

Description: The Province of Noord-Brabant has asked the Rathenau Instituut to analyse the interests, opinions and questions that society and experts have raised concerning ultra-deep geothermal energy. The project will enable the Province to identify early on which issues are sensitive ones in this area, what knowledge we still lack, and who should be involved.

Stakeholders: Polymakers at the Province of Noord-Brabant and parties involved in the Geothermal Energy Green Deal.

In 2016... we held a kick-off meeting, performed a stakeholder analysis, organised a workshop, and wrote the draft report.

Alternatives to animal testing

Project team: Lisa van Bodegom, Ingrid Geesink, Melanie Peters

Description: The Ministry of Education, Culture and Science has asked the Rathenau Instituut, as an independent organisation, to conduct a foresight study on the status of animal testing with primates, both now and in the near future. The request came after a motion was submitted to the House of Representatives asking the State Secretary to investigate the gradual suspension of animal testing with primates in the Netherlands.

Stakeholders: House of Representatives, Minister of Education, Culture and Science, and relevant parties in the field of animal testing such as the Biomedical Primate Research Centre, the Netherlands National Committee for the protection of animals used for scientific purposes (NCAD) and the Central Authority for Scientific Procedures on Animals (CCD).

In 2016... we launched the project, held a stakeholder dialogue, and wrote the draft foresight study report.

JRC course on Evidence-Based Policy

Project team: Patricia Faasse, Ira van Keulen, Barend van der Meulen, Melanie Peters, Pascal Messer

Description: The EU’s Joint Research Centre asked the Rathenau Instituut to develop three courses on evidence-based policy for its research staff. The purpose is to make researchers more aware of the policy context of their research.

Stakeholders: Research staff at the Brussels offices of the Joint Research Centre.
In 2016... we launched the project and worked on the courses, which we will give and publish in 2017.

The future of science journalism

Project team: Leonie van Drooge, Ingrid Geesink, Iris Korthagen

Description: The study focuses on the contribution that independent science journalism makes to the dialogue between science and society. Its aim is to link insights that emerged in earlier projects, such as “Trust in science” and “Evidence-Based Policy”, to the debate about the future of science journalism.

Stakeholders: Politicians and policymakers concerned with science and media policy, science communication and science journalism practitioners, researchers who study science communication and media studies, intermediary organisations and knowledge institutions that play a role in interpreting scientific knowledge for the public.

In 2016... we analysed the data and published the report *Wakers van de wetenschap* (Guardians of science) and presented our findings, among others at a national conference for science and engineering communication professionals.

Theme 5: Responsible science

Guiding scientific research by means of policy is no simple matter. Often, it is unclear how policy measures will influence research practice. For example, the policy of encouraging talented academics has led mainly to intense competition. The Rathenau Instituut supplies facts and figures and monitors the effects of policy, producing long-term analyses and other results.

Science in Figures website

Project team: Catherine Chiong Meza, Jos de Jonge, Jan van Steen, Alexandra Vennekens

Description: The Science in Figures website (www.rathenau.nl/en/science-in-figures) ensures that we can debate the issues related to science and innovation based on reliable and trusted data. The site presents key figures on the structure and funding of the Dutch science system, the people who work in it, their work, the results they have achieved, and the impact of science on society.

Stakeholders: The site is meant for all parties in the Dutch science system. Other key users include Parliament and the media.

In 2016... we launched both the Dutch and English versions of the site, extended the site, and published about a hundred factsheets.

TWIN figures and regional TWIN figures

Project team: Hanneke Bodewes, Jasper Deuten, Jos de Jonge, Jan van Steen, Alexandra Vennekens

Description: Annual publication surveying total public investment in research and innovation (projected and actual). This project ensures that up-to-date information is available every year on actual government spending patterns and that discussions of such spending are based on facts. We undertake this annual analysis at the request of the Ministry of Education, Culture and Science and the Ministry of Economic Affairs.

Stakeholders: Ministries, Parliament, the media, researchers and research organisations.

In 2016... we published the latest figures, refined the project by adding regional data, and worked on the figures for 2017.

Effects of national strategic positioning policy on university research

Project team: Edwin Horlings, Elizabeth Koier, Barend van der Meulen, Wout Scholten

Description: The study examines the way in which university research is being funded at the present time. There is confusion about this within government, at research organisations and universities, among researchers and in the public. The study raises a number of issues concerning the funding and governance of research.

Stakeholders: Government, research organisations, universities, researchers and the general public.

In 2016... we published the reports *Spinning plates* and *Effecten van profileringsbeleid* (Effects of national strategic positioning policy), developed a course on allocation models for the University of Amsterdam and gave various presentations.

Research excellence

Project team: Leonie van Drooge, Patricia Faasse, Laurens Hessels, Edwin Horlings, Wout Scholten

Description: The project is meant to analyse the effects of 25 years of policy meant to encourage research excellence and to better understand the dynamics behind excellent research groups.

Stakeholders: Policymakers, public administrators, research organisations and researchers.

In 2016... we joined with the Centre for Science and Technology Studies (CWTS) in publishing the first interim report, *Excellent geld* (Excellent money), which presents case studies of four excellent research groups. We also organised a national and an international workshop.

Science Audit

Project team: Catherine Chiong Meza, Edwin Horlings, Barend van der Meulen, Alexandra Vennekens (external members: Kathleen Torrance (AWTI), Ans Vollering (Royal Academy))

Description: The project focuses on the current status of Dutch research policy taking the Government's Vision for Science 2025 as the benchmark. This first audit is a baseline measure. Subsequent audits should reveal to what extent the Government's policy objectives have been achieved. The study should contribute to the dialogue about science. The Science Audit is being drafted at the request of the Ministry of Education, Culture and Science and is a collaborative effort between the Rathenau Instituut, the Advisory Council for Science, Technology and Innovation (AWTI), and the Royal Netherlands Academy of Arts and Sciences.

Stakeholders: Ministries, Parliament, policymakers.

In 2016... we collected data, organised a workshop, wrote the draft version, and prepared the report for publication.

Joint health fundraising organisations

Project team: Leonie Drooge, Edwin Horlings

Description: The joint health fundraising organisations asked the Rathenau Instituut to help them chart their vision and strategy for the future of health research and their position in that context.

Stakeholders: Joint health fundraising organisations.

In 2016... we launched the project, analysed the context, conducted interviews, published our reported, and gave a presentation at the annual conference of the joint health fundraising organisations.

OECD educational research

Project team: Jos de Jonge

Description: The project is being carried out at the request of the Ministry of Education, Culture and Science. It is meant to survey how educational R&D is organised in the Netherlands, what subjects that research focuses on, and how much money is involved. The report on the findings will serve as a country report for an OECD publication.

Stakeholders: Ministry of Education, Culture and Science, OECD, educational researchers.

In 2016... we presented the draft report to the OECD.

3 Board and Programme Panel

Rathenau Instituut Board in 2016

The chairperson and Board members are appointed on the recommendation of the institute's Board once the Boards of the Royal Netherlands Academy of Arts and Sciences and the Scientific Council for Government Policy (WRR) have expressed their views. The director of the Rathenau Instituut is the secretary of the Board.

- **Gerdi Alida Verbeet** (chair): Supervisory Director of charity organisation Novamedia, Siemens Nederland, the Dutch Patient and Consumer Federation, Het Loo Palace, and chair of the National 4 and 5 May Committee, which organises the national ceremonies commemorating the war dead and celebrating Liberation Day.
- **Prof. Emile Aarts**: Rector of Tilburg University.
- **Prof. Wiebe Bijker**: Professor of Technology and Society, Maastricht University and Norwegian University for Science and Technology in Trondheim.
- **Prof. Roshan Cools**: Professor of Cognitive Neuropsychiatry at Radboud University Medical Centre.
- **Dr Hans Dröge**: Supervisory Director of the Brabant Development Agency and Koninklijke Sanders.
- **Edwin van Huis**: Director of Naturalis Biodiversity Center, Leiden.
- **Prof. Rianne Letschert** (as of July 2016): Rector of Maastricht University.
- **Prof. Harry Lintsen** (until July 2016): Emeritus Professor of the History of Technology, Eindhoven University of Technology.
- **Prof. Corien Prins** (until July 2016): Dean of the Faculty of Law, Tilburg University
- **Prof. Peter-Paul Verbeek** (as of July 2016): Professor of the Philosophy of Humans and Technology and Co-director of the DesignLab, University of Twente.
- **Prof. Marijk van der Wende**: Professor of Higher Education and Dean of Graduate Studies, Utrecht University.
- **Dr Melanie Peters**: Secretary of the Board.

More information about the Board members is available at: www.rathenau.nl/en/page/board

Rathenau Instituut Programme Panel in 2016

The Rathenau Instituut's Programme Panel meets a number of times each year to discuss new developments and the institute's research programme. The panel was set up by the Rathenau Instituut's Board. The Board's chairperson is also the chair of the Programme Panel. The director of the Rathenau Instituut is its secretary.

- **Gerdi Alida Verbeet** (chair): Supervisory Director of charity organisation Novamedia, Siemens Nederland, the Dutch Patient and Consumer Federation, Het Loo Palace, and chair of the National 4 and 5 May Committee, which organises the national ceremonies commemorating the war dead and celebrating Liberation Day.
- **Melanie Peters**: Secretary of the Board.
- **Annet Aris** teaches digital strategy at INSEAD Business School in France. She is a supervisory director at ASML, ASR, Thomas Cook and ProSiebenSat1, chairs Stichting Volkskrant, and writes a column for Het Financieel Dagblad on the digital transformation.
- **Marien Baerveldt** builds innovative learning communities at Utrecht University and is a team and process supervisor at Hosted Beings.
- **Rob Bijl** is the deputy director of the Netherlands Institute for Social Research (SCP).
- **Marc Chavannes** is a journalist and emeritus professor of journalism (University of Groningen).
- **Felix Cohen** is the director of the Dutch Traffic Safety Association and a supervisory director at Regina Coeli language training institute.
- **Willem Deetman** (former minister of education and mayor of The Hague), is a supervisory director of ADO football club, chair of the board of the Cloister Church in The Hague, and chair of the supervisory board of Haaglanden Medical Centre.
- **Linda Duits** is a researcher, publicist and teacher. She is affiliated with the Institute for Cultural Inquiry at Utrecht University.
- **Bas Eickhout** represents the Dutch political party GroenLinks in the European Parliament as a member of the Greens/Free European Alliance political grouping.

- **Bert Fokkema** is part of an international team at Shell that develops policy and internal standards for the decommissioning of oil and gas production systems. He is responsible for external relations.
- **Yuri van Geest** is the initiator of the Singularity University NL, the founder of ExOxo (corporate transformation), and co-author of the book *Exponential Organisations*, which has been published in 16 languages.
- **Peter Giesen** is an editor and Paris correspondent for Dutch national newspaper *de Volkskrant*.
- **Rob Hamer** is the director of the Unilever Vlaardingen R&D laboratory and chair of the technology committee at VNO-NCW employers' association.
- **Rob van Hattum** is the executive science editor for broadcasting association VPRO and the Chief Science Officer at NEMO science museum.
- **Janneke Hoekstra** is the head of the Faculty of Engineering at HAN University of Applied Sciences.
- **Yori Kamphuis** is co-founder of Cobblue, a company that delivers safe software and security systems. He is also the co-founder of Storro, a peer-to-peer blockchain application for file sharing and storage outside the cloud.
- **Annette Klinkert** is the founder of city2science.
- **Laurien Koster** is the independent chairperson of the Kinderrechtencollectief and a supervisory director at Oxfam Novib.
- **Chris Kuijpers** is the director-general for Environment and International Affairs at the Ministry of Infrastructure and the Environment.
- **Willem Lageweg** holds a number of board and supervisory positions, for example with Triodos Bank, Close the Gap, the Louis Bolkinstituut and the Institute for Positive Health. He is the co-founder of a Responsible Business Conduct network in Kenya and is closely involved in the transition in the agri-food sector.
- **Jolien Morren** is working on her Master's in Biology and Science Communication & Society at Leiden University.
- **Dirk Pilat** is the deputy director of the Science, Technology and Innovation Directorate of the Organisation for Economic Co-operation and Development (OECD) in Paris.
- **Stientje van Veldhoven** is a member of the Democrats '66 political group in the House of Representatives.
- **Marijke Vos** was a senator for the GroenLinks political party (until mid-2016). She was previously the party chairperson, a member of the House of Representatives, and an executive councillor in Amsterdam.
- **Jeanine van de Wiel** is Global Regulatory Affairs Manager at DSM for food ingredients and health.
- **Lynn Zebeda** is the co-founder of the Dr. Monk innovation studio.

More information on the members of the Programme Panel is available (in Dutch) at: www.rathenau.nl/nl/page/programmaraad

4 Annual financial report

In 2016, the Rathenau Instituut continued to align its budget with recent mandatory austerity measures.

Income in 2016

In 2016, the Rathenau Instituut earned k€ 4,864 in income. That is k€ 73 more than budgeted. The institute received k€ 4,070 in basic funding from the Dutch Ministry of Education, Culture and Science. In addition, in the final quarter of 2016 it received k€ 87 in structural wage compensation. Of that amount, the Royal Academy withheld k€ 7 as the institute's contribution to the central works council. The share of earned income from external contract projects came to 14% of the total (and 16% of the basic funding amount). Other extra revenue came from copyrights and staff-related payments, such as holiday pay and social security reimbursements. The institute earned contract-related income in 20 externally financed projects, including EU projects and projects carried out for the Dutch Ministries of Economic Affairs, Education, Culture & Science, and Infrastructure & the Environment. In addition, it also undertook a number of small assignments. We submitted more tenders on calls involving external financing. That has not yet led to more external revenue. It did, however, help us expand our network. We received more invitations to submit tenders for project proposals, and commissioning parties returned with new requests.

Income	Income earned in x € 1.000	Budgeted 2016 x € 1.000	Difference x € 1.000
Funding from Ministry of Education, Culture & Science	4,150	4,070	80
Project revenues	660	700	-40
Other revenue	53	20	33
Total income	4,863	4,790	73

Expenditure in 2016

Total expenditure in 2016 came to k€ 4,595. This is k€ 636 less than budgeted. Some job openings remained vacant longer than anticipated. Vacancies owing to long-term sick leave or maternity leave were filled internally or replaced only partially by insourced staff (on balance, a reduction in expenditure of k€ 143). Material costs were reduced, for example owing to our new publication policy (more digital, less paper, discontinuation of FLUX magazine) and more meetings organised internally (made possible by a building renovation). Staffing and material expenditure on externally financed projects was k€ 108 lower than budgeted. Some of the investment projects taken on for strategic reasons cost less than anticipated, while others will be carried out in 2017 and 2018 (k€ 211). Other material and staffing costs were k€ 43 higher owing to extra reduced-pay obligations.

Expenditure			
Staffing costs	3,313	3,533	-220
Project costs	575	948	-373
Material costs	707	750	-43
Total liabilities	4,595	5,231	-636

Year	2012	2013	2014	2015	2016
Total income x €1000	5,118	5,264	5,166	4,911	4,863
Contract project income x € 1000	373	497	776	687	660
% Contract income compared to total	7%	9%	15%	14%	14%

Annual financial statements

The institute's annual financial statements are consolidated into the annual financial statements of the Royal Netherlands Academy of Arts and Sciences. As such, they are included in the Academy's annual report.

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The Rathenau Instituut stimulates public and political opinion forming on social aspects of science and technology. We perform research and organise debate relating to science, innovation and new technologies.

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