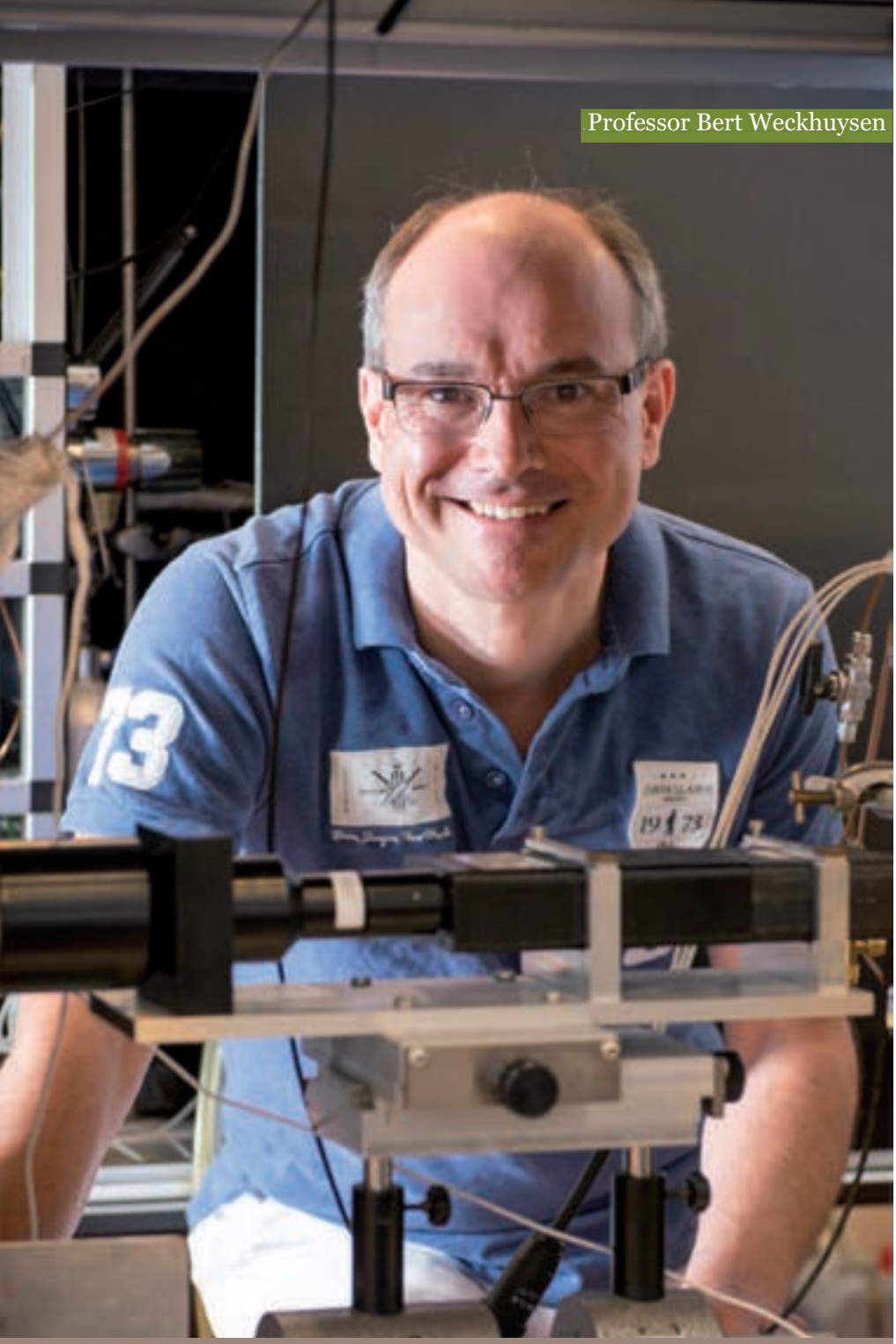
Gravitation programme: € 60 million for two Dutch multidisciplinary chemical consortia

Chemists working together with immunologists on new treatments against autoimmune disease or infections. Catalyst researchers, experts in microfluidics and colloid scientists cooperating on new, sustainable energy sources. These two multidisciplinary consortia of researchers were awarded about 30 million euros each within the NWO Gravitation programme.

'The Gravitation programme was the perfect occasion for bringing together different fields of research into a joint proposal', say both Prof. Bert Weckhuysen, leader of the Netherlands Center for Multiscale Catalytic Energy Conversion, and Prof. Sjaak Neefjes, principal researcher of the Institute for Chemical Immunology. Weckhuysen adds: 'It is a privilege to be able to conduct long-term, fundamental research within newly defined multidisciplinary fields, together with internationally renowned specialists. For my group, the fundamental research conducted in the Gravitation programme will form one of the cornerstones of our more application-oriented work, financed for example within the Top Sector policy.'

Catalysts from atom to reactor, and back

Weckhuysen is the initiator of the Netherlands Center for Multiscale Catalytic Energy Conversion. The professor of inorganic chemistry and catalysis and a recipient of both a Spinoza Prize and an ERC Advanced Grant for his in-situ characterisation of catalysts clearly remembers the starting point for the consortium. 'During a sabbatical at Stanford I met a lady who was working on fluid dynamics in porous rock, and it hit me: catalysts are also porous materials, so I should cooperate with experts in fluid dynamics.' Back in the Netherlands, his search led him to fellow Spinoza Prize winners Albert van den Berg and Detlef Lohse at the University of Twente. 'On a Sunday evening I had my first telephone call with Detlef' Weckhuysen recollects. 'He was immediately intrigued by the idea of applying microfluidics to catalyst research.' Many more Sunday evening conference calls followed with Detlef Lohse and Albert van den Berg but also with Eindhoven chemists Hans Kuipers and Rutger van Santen and Utrecht physicist Alfons van Blaaderen. 'The result is a consortium that is able to study catalytic processes from the atomic scale to the actual chemical process within the reactor, and back.' That multiscale approach is necessary to achieve paradigm-shifting results, he emphasises. 'You could compare it to a car. Catalyst researchers mainly work on the engine. But if the fuel and the coachwork of the car aren't optimised at the same time, it will be impossible to make a car that performs an order of magnitude better than the current ones.'



Professor Bert Weckhuysen

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The ultimate goal is to develop highly efficient catalytic materials and processes to produce energy and energy carriers from various sources such as fossil fuels, biomass and solar energy. Weckhuysen has no doubt that the Center will indeed make giant leaps forward. 'Nevertheless, it will probably take years before we can produce completely new forms of energy, such as solar fuels,' he says. 'But I am convinced that we will find many new leads to improve our current production processes along the way.'

New therapies

Neefjes, a cell biologist and immunologist at Leiden University and the Netherlands Cancer Institute (NKI), used the Gravitation programme to institutionalise the 'chemical biology' cooperation he has with Leiden University chemist Prof. Hermen Overkleeft and NKI colleague Prof. Huib Ovaa. Together with the Radboud University Nijmegen Medical Center and Utrecht University, Overkleeft and Neefjes established the Institute for Chemical Immunology. This institute brings together the Dutch top in immunology and chemistry to facilitate their work on understanding immune diseases and developing therapies. Neefjes: 'Dutch chemistry and immunology are both world class. These fields can complement each other, for example by closing the chain from the discovery of promising biological pathways to the actual generation of

Gravitation programma encourages excellent scientific research

NWO's Gravitation (Dutch: Zwaartekracht) programme encourages consortia to cooperate on the basis of an excellent scientific research programme. In December 2013, six research consortia from different Dutch universities received a total of 153 million euros to set up excellent scientific research programmes for a period of ten years. The funding is intended for highly ambitious research programmes that have the potential to bring about international breakthroughs. The Netherlands Center for Multiscale Catalytic Energy Conversion of Prof. Bert Weckhuysen and his colleagues received 31.9 million euros. The Institute for Chemical Immunology of Prof. Sjaak Neefjes and his colleagues received 27.6 million euros. The other four consortia focus on climate, microbiology, networks and optical technology.

More information: www.nwo.nl/zwaartekracht

bioactive compounds. We want to accelerate the immune system in the case of an infection and oncology but also to decelerate it when it responds in an overactive way, as is the case in autoimmune diseases like rheumatoid arthritis.'

The newly established institute offers a complete pipeline to allow bench-to-bedside activities, Neefjes explains. 'Together we have the expertise that is needed to discover bioactive compounds, to design and produce custom-made molecules, and to test their effect on cells. On top of that, we have mouse models and patient data to bring potential candidates towards application. We are only missing a bit of expertise relating to the final steps in clinical application,' he says. 'But we are certainly planning on getting these people on board when required.'

To make sure both fields really interact, every project will be carried out jointly by a chemist and an immunologist. Neefjes: 'Eventually, the results should be suitable for publication in high-impact journals in the fields of both chemistry and immunology.' Education is essential if this new field is to progress. 'Chemists should be able to understand basic immunology principles, and immunologists need to understand chemistry as well.' The appointment of a tenure-track researcher will help the institute establish a whole new field of research. 'Nowhere in the world are these fields intertwined on the same scale as within our institute. I expect that in ten years time, similar cooperative programmes will have been set up elsewhere as well', Neefjes concludes.

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Professor Sjaak Neefjes