Summaries of projects awarded funding in Gravitation call 2016-2017

Materials-driven regeneration: Regenerating tissue and organ function with intelligent, life-like materials

Main applicant: Prof. C.V.C. Bouten (Eindhoven University of Technology)
Co-applicants: Prof. M.C. Verhaar (University Medical Center Utrecht), Prof. P. Habibovic (Maastricht University), Prof. E.W. Meijer (Eindhoven University of Technology), Prof. J.C. Clevers (Hubrecht Institute), Prof. C.A. van Blitterswijk (Maastricht University)
Institution acting as official secretary: Eindhoven University of Technology

Amount awarded: 18.8 million euros
Regenerative medicine makes use of the regenerative capability of the human body to heal damaged or diseased tissues and organs. In the Center for Materials-Driven Regeneration, materials scientists, cell biologists, tissue engineers and medical scientists are jointly working on a new approach in which intelligent materials are used to coax the body into restoring itself. With this multidisciplinary approach, the consortium wants to tackle one of the biggest and costliest challenges of healthcare: the cure of chronic diseases, such as cardiovascular diseases, musculoskeletal disorders, and organ diseases such as kidney failure.

Quantum Software Consortium

Main applicant: Prof. H.M. Buhrman (CWI/ University of Amsterdam)
Co-applicants: Prof. D. Bouwmeester (Leiden University), Prof. R. Cramer (CWI/Leiden University), Prof. R. Hanson (Delft University of Technology), Prof. S.D.C. Wehner (Delft University of Technology), Prof. R. de Wolf (CWI/University of Amsterdam)
Institution acting as official secretary: Leiden University
Amount awarded: 18.8 million euros
Quantum computers and quantum networks have the potential to radically change information and communication technology due to the power of quantum superposition, interference and entanglement. Several applications of such quantum computers and networks have been known since the 1990s but these require large-scale systems that still lie in the future. Smaller systems (with a very limited number of quantum bits) already exist and slightly larger quantum computers and networks will be available in the near future. This will make it possible for the first time to program quantum computers and networks as well as to develop and test the software for these. The Quantum Software Consortium will bring together researchers from computer science, mathematics and physics to invent and demonstrate the first applications for these computers and the internet of the future.

BaSyC – Building a Synthetic Cell

Main applicant: Prof. A.M. Dogterom (Delft University of Technology)
Co-applicants: Prof. G.H. Koenderink (AMOLF), Prof. B. Poolman (University of Groningen), Prof. J. van der Oost (Wageningen University), Prof. W.T.S. Huck (Radboud University), Prof. C. Dekker (Delft University of Technology)
Institution acting as official secretary: Delft University of Technology
Amount awarded: 18.8 million euros
The construction of an artificial biological cell is one of the biggest scientific challenges of the 21st-century. We have an extensive knowledge of the molecular building blocks that form the basis of life but we do not understand how these building blocks work together to make life possible. Therefore in BaSyC we will bring

together our knowledge in chemistry, physics and biology to construct a synthetic cell by using a bottom-up approach. In other words we will combine the biomolecular building blocks to make an autonomous cell that can maintain itself, grow and divide.
A fundamental understanding of life in a cell will lead to enormous intellectual, scientific and technological benefits. Yet at the same time it will elicit philosophical and ethical questions about how society can best use the new insights and possibilities.

Netherlands Organ-on-Chip Initiative

Main applicant: Prof. C.L. Mummery (Leiden University Medical Center)
Co-applicants: Prof. M.D. Ferrari (Leiden University Medical Center), Prof. J.C. Clevers (Hubrecht Institute), Prof. P.M. Sarro (Delft University of Technology), Prof. A. van den Berg (University of Twente), Prof. C. Wijmenga (University Medical Center Groningen)
Institution acting as official secretary: Leiden University
Amount awarded: 18.8 million euros
For many common diseases in humans, there are no good laboratory models to study the condition. Using stem cells from patients we will develop "disease-specific miniature organs on microchips" to investigate precise mechanisms underlying diseases of the heart, brain and intestine and the effects of intestinal bacteria and drugs on these processes. Simulating and studying the smallest functional building blocks of these tissues in “organs-on-a-chip” will allow us to identify new drug targets. Linking organ chips together will also allow us to investigate how diseased organs and intestinal bacteria influence each other. With this approach we hope to learn more about how certain diseases arise and how they might be treated.

Anchoring Innovation

Main applicant: Prof. I. Sluiter (Leiden University)
Co-applicants: Prof. A.P.M.H. Lardinois (Radboud University), Prof. J.H. Blok (Utrecht University), Prof. C.H.M. Kroon (University of Amsterdam), Prof. L. de Ligt (Leiden University), Prof. M.J. Versluys (Leiden University)
Institution acting as official secretary: Radboud University
Amount awarded: 18.8 million euros

The ancient Greeks and Romans were great innovators. New ideas abounded in science and technology, literature and arts, politics, the economy and many other domains of life. How did those innovations come about? How do inventions and new ideas turn into actual (accepted) innovation? This is studied by a team of Dutch classicists (OIKOS).
Our hypothesis is that tradition and innovation are not simply juxtaposed or even opposed. In successful innovations, people perceive a meaningful coherence between the new and the familiar. For this multifaceted phenomenon OIKOS uses the concept of ‘anchoring’. Developing this concept in an investigation of Greco-Roman antiquity results in a new and better understanding of innovation processes of all times.

SCOOP: Sustainable Cooperation - Roadmaps to a Resilient Society

Main applicant: Prof. R.P.M. Wittek (University of Groningen)

Co-applicants: Prof. N. Ellemers (Utrecht University), Prof. M. van Hees (VU University Amsterdam), Prof. T. van der Lippe (Utrecht University), Prof. R. Spears (University of Groningen), Prof. B. van Bavel (Utrecht University)
Institution acting as official secretary: University of Groningen
Amount awarded: 18.8 million euros

Cooperation is key to resilient families, communities, and organizations. Through cooperation, individuals can realize benefits they cannot achieve on their own. But why do some cooperative arrangements decline, whereas others remain impressively stable and thrive? Will our current cooperative arrangements remain effective when confronted with major societal transformations, like population aging, mass migration, and the digital revolution? Integrating the expertise of sociologists, psychologists, historians and philosophers, SCOOP investigates novel solutions to enhance sustainable cooperation in the domains of care, work, and inclusion. An innovative mixed-method research design assesses their effectiveness and delivers evidence-based policy advice.